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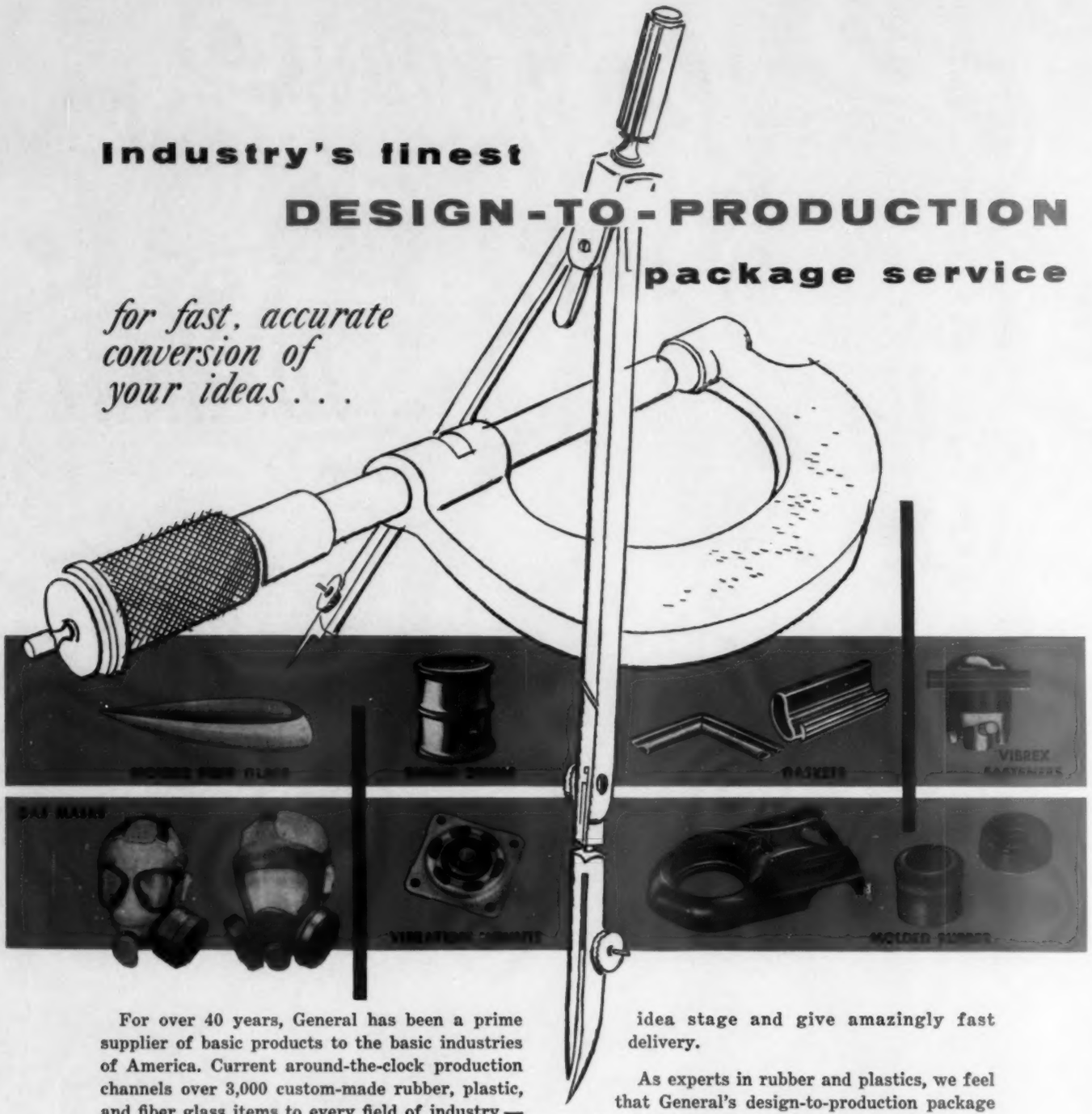

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FRONT COVER

Oldest infantry regiment among the active status units of the U.S. Army is the 3rd Infantry, stationed at Ft. Myer, Va., just outside the City of Washington, D.C. Ceremonial unit for the Nation's Capital and the Arlington National Cemetery, it traces its illustrious combat record to the Revolutionary War, and the "Spirit of 1776" continues to prevade its ranks. Here is the Color Guard of the 1st Battle Group of the Regiment in their Revolutionary War uniforms worn by the regiment on patriotic occasions.

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The members of this Association, mindful of the vital importance to national defense of chemistry, allied sciences, and the arts derived from them, have joined together as a patriotic obligation to preserve the knowledge of, and interest in, national defense problems derived from wartime experience; to extend the knowledge of, and interest in, these problems; and to promote cooperative endeavor among its members, the Armed Services, and civilian organizations in applying science to the problems confronting the military services and other defense agencies, particularly, but not exclusively in fields related to chemical warfare. (From Art. II, AFCA Constitution.)

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GENERAL LYMAN L. LEMNITZER

The Army's New CHIEF OF STAFF

On July 1 this year General Lyman L. Lemnitzer was sworn in and assumed duty as Chief of Staff, United States Army, replacing General Maxwell Taylor, who retired. General Taylor had held this top Army position for four years, and General Lemnitzer had been on duty in Washington as Vice Chief of Staff since July 1957.

Born in Honesdale, Pa., August 28, 1899, General Lemnitzer was graduated from the United States Military Academy in June 1920, receiving his first commission as 2nd Lieutenant of Coast Artillery on July 2 of that year.

The new Chief of Staff's long and distinguished career has included assignments as instructor at West Point and the Coast Artillery School; commander of the 34th Anti-aircraft Artillery Brigade in World War II during campaigns in North Africa and Sicily, and as Chief of Staff of the Supreme Allied Command, Mediterranean.

He participated in a number of important discussions with the Allies and managed the Allied discussions with the German High Command in Switzerland in March 1945 which resulted in the unconditional surrender of the German Army of Italy and Southern Austria.

After World War II, General Lemnitzer served as Army member. Joint Strategic Survey Committee, Joint Chiefs of Staff; as the Deputy Commandant of the National War College, and as assistant to the Secretary of Defense on the foreign aid program as Director of the Office of Military Assistance.

At the age of 51, General Lemnitzer qualified at the Infantry School as a paratrooper and thereafter assumed command of the 11th Airborne Division at Fort Knox. December 1951 found him in Korea in command of the Seventh Infantry Division. On August 1, 1952 he was

(Continued on next page)

back in Washington as Deputy Chief of Staff of the Army for Plans and Research.

On March 24, 1955 he received his fourth star as a full General and on the day following was named Commanding General of the Army Forces in the Far East and the Eighth Army. Three months later he became Commander-in-Chief, Far East Command, and Commander-in-Chief, United Nations Command, which positions he held until again returning to Washington to become Vice Chief of Staff.

Like other Chiefs of Staff, especially the last two, Generals Maxwell Taylor and Matthew B. Ridgway, General Lemnitzer—despite the Army's increasing concern with complex machines, weapons and technology—stresses "the ultimately decisive impact of the individual qualities of character, courage and determination". In a recent address to the Association of Military Colleges and Schools of the United States, he summed up his views in that respect with these words:

"In sum, man is and will remain the essential element in war. Men, not machines, win or lose the battle. Machines cannot wage war; they can only increase the effectiveness of man. The importance of the individual increases with the complexity of the weapons he must employ. The importance of the man will increase until we reach the stage of having weapons which can think and improvise; which can meet reverses with resolution; and which can match hardship and danger with devotion and courage, and carry on to final victory. There is no such weapon on the horizon."

Government Looked To As Main Support Of Basic Research

EDGEWOOD, MD. — Basic research, traditionally financed by private philanthropy and carried on in universities, must now look to the government for support if it is to keep pace with the burgeoning technology of the Atomic Age, according to Mr. Welcome W. Bender, director of the Research Institute for Advanced Study (RIAS) of Baltimore. Mr. Bender propounded this thesis last May in an address to the Army Chemical Center chapter of the Scientific Research Society of America (RESA).

His topic was "Basic Research on a Sound Economical Basis."

Mr. Bender told the group that the tax structure since World War II has severely curtailed the accumulation of the great personal fortunes which in the past have supported basic research in the universities.

Government and industrial research, of necessity more pragmatic, put primary stress on applied research and technology with specific goals and products in mind, he said.

As technology continues to swell in volume and accomplishments, the ratio between it and essential basic research will be thrown even farther out of balance, and the government, Mr. Bender argued, must ultimately provide the funds and support to keep such research going.

Founded in 1955 by The Martin Company, the Institute (RIAS) is an experiment as a "privately sponsored, autonomous institute for creative scientific studies, with no applications in mind."

Some 75 scientists are currently employed by it. Half of the Institute's funds stem from contracts with such government agencies, and the percentage, Mr. Bender said, is continually increasing.

MIT SCIENTIST IS NOW HEAD OF NATIONAL INVENTORS COUNCIL

Considerable interest in the scientific and industrial world attaches to the appointment of a new Chairman of the National Inventors Council to succeed Dr. Charles F. Kettering, who died last November. The new encumbent is Dr. C. S. Draper, head of the Department of Aeronautics and Astronautics, Massachusetts Institute of Technology.

Dr. Draper is a pioneer inventor of inertial guidance systems for aircraft, missiles, and submarines.

The National Inventors Council, composed of distinguished scientists, engineers, research administrators, and the chiefs of research of the Armed Services, serves as liaison agency between the Armed Forces and the nation's civilian inventors.

Dr. Draper was born in Windsor, Missouri, on October 2, 1901. He began his college work at the University of Missouri in 1917 and later transferred to Stanford University in 1919, where he obtained a bachelor degree in 1922. He then entered Massachusetts Institute of Technology, with which institution he has been associated ever since. He holds three degrees from MIT: Bachelor, Master, and Doctor of Science.

Another interesting new appointment to the Council is that of Mr. Homer H. Ewing, of Greenville, Deleware, to serve as Secretary. He is a staff member of E. I. duPont de Nemours and Company. He has been with the Company since 1918 and among the positions held are Assistant Manager of the London Office, European Manager, Assistant Director of Electro-Chemicals Departments, Development Division, and Manager of the Ceramics Division.

Mr. Ewing has a Bachelor of Science degree in Mechanical Engineering from the University of Delaware, Since 1948 he has been a member of the National Industrial Review Committee of the Department of Defense.

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ALL OFFICERS OF A.F.C.A. RE-ELECTED FOR 1959-60

At the annual spring meeting of the Board of Directors held in Washington, D.C., May 18, Brigadier General Clifford L. Sayre, USAR, chief of Central Engineering of Food Machinery and Chemical Corporation, was re-elected President of the Armed Forces Chemical Association.

Likewise all of the other officers of the Association (listed on page 2 herein) were re-elected for the ensuing fiscal year 1959-60.

N. Y. CHAPTER MEETS AT ACC WARD JACKSON GIVEN PLAQUE

Mr. W. Ward Jackson, vice president of Commercial Solvents Corporation and past president of the New York Chapter, A.F.C.A., receives a Chemical Corps Certificate of Achievement from Major General Stubbs, Army Chief Chemical Officer.

ARMY CHEMICAL CENTER, MD.—More than 70 industry executives from the New York City area, members of the New York Chapter, Armed Forces Chemical Association, spent a day last April observing the Army's Chemical Corps in action, hearing of the most up-to-date developments and learning some of the problems faced in the program of researching for more effective weapons, chemical agents and protective systems.

They not only saw the Chemical Corps as it is today, but were told by the Corps' Chief, Major General Marshall Stubbs, how they, and others may assist the Army in its search for better ways of accomplishing the national defense mission.

In a welcoming address to the group, General Stubbs outlined two methods through which the Chemical Corps hopes to better its program and obtain military advantage from prior work done by private industry.

The already functioning and proven beneficial "Industrial Liaison" program of the Corps was briefly explained. Through this program samples of compounds, etc., developed by industry are submitted for examination to ascertain their possible application as chemical warfare agents, weapons and defensive items. All such materials are handled with utmost discretion to safeguard company information.

The other, and newer, scheme to obtain new ideas is General Stubbs' "Blue Skies" program, under which opportunity is afforded to air any ideas for improvement and modernization of the Corps.

At a luncheon, held at the Officers' Mess here, in conjunction with the A.F.C.A. tour, General Stubbs awarded a plaque and the Army Certificate of Appreciation to Mr. W. Ward Jackson, vice-president of the Commercial Solvents Corporation of New York, and past president of the New York chapter, A.F.C.A.

Mr. Jackson was cited for "generous contributions of time and effort in support of Chemical Corps objectives.

Appreciation by President Sayre

May 1, 1959

Major General Marshall Stubbs
Chief Chemical Officer
Department of the Army
Building T-7
Washington 25, D.C.
Dear Marshall:

Even though I verbally expressed my appreciation for the fine meeting which the Chemical Corps put on for the New York A.F.C.A. Chapter, I want to go on record and thank you again. General Walmsley and his able staff certainly put forth a major effort and I am certain that it paid off. Not only did it give our members a deeper insight into the activities and problems of the Corps, but I feel that your staff people at the ACC also received a great deal of encouragement by the presence of so many interested people.

I am sure the word of the success of this meeting will spread and that it will be a model and example for our other chapters which are near Chemical Corps installations to do likewise. . . .

I am writing to General Walmsley also to express the appreciation of the national president and headquarters although I, too, recognize that this was a local activity of Jim Sheridan, Joel Henry, and the other cooperating members of the New York Chapter.

Very sincerely yours
(Signed) CLIFF
Clifford L. Sayre
President, AFCA.

NEW ENGLAND CHAPTER HOLDS MEETING AT NATICK, MASS.

Major General Marshall Stubbs, Army Chief Chemical Officer, was guest speaker before the meeting of the New England Chapter, held at the QM Research and Engineering Command Headquarters, at Natick, Mass., on the evening of 22 May, 1959. General Stubbs spoke on the subject of CBR Warfare.

The meeting was regarded as one of the most important and successful recently held by the Chapter.

A letter of appreciation was sent to General Stubbs by Mr. Harry A. Wansker, Chapter President, extending thanks of the Chapter also to the personnel of General Stubbs' Command who contributed to the program.

A letter from Mr. Wansker was also sent to Major General C. G. Calloway, Commanding General, QM Research and Engineering Command, expressing the appreciation of the Chapter to him and his staff for their assistance and cooperation in arranging the meeting.

(Continued on page 10)

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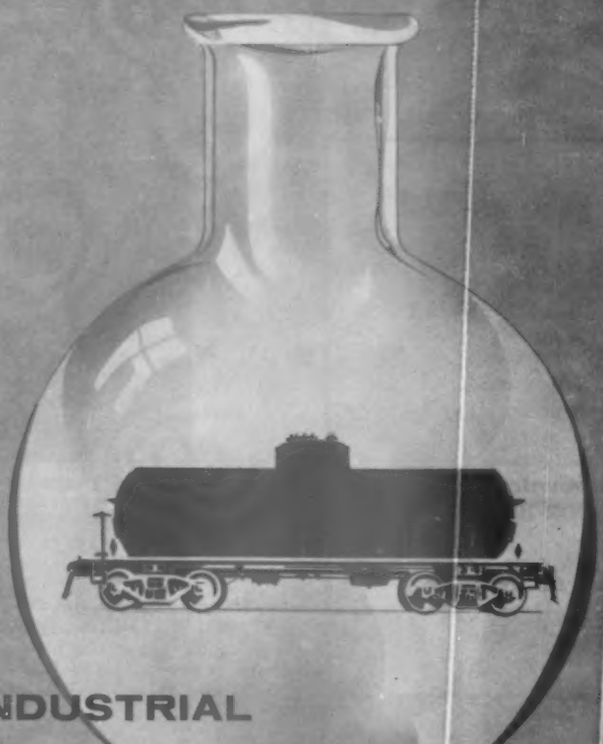

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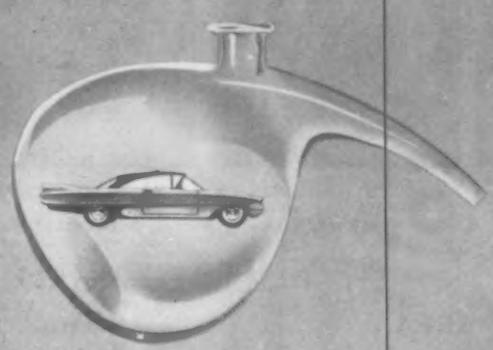

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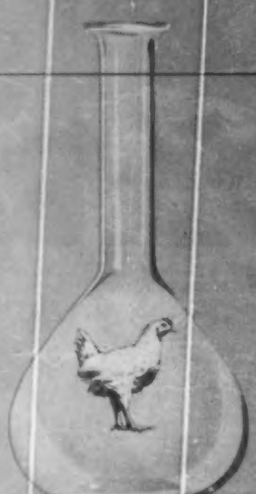

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MR. C. J. MAUPIN

#1, NEW ENGLAND AREA

Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island

DR. HAROLD C. WEBER
(M.I.T.)
67 Vose Hill Road
Milton, Mass.

The election of the 20 Directors-at-Large for the year 1959-1960 reflects a recent action of the Board establishing eight (8) geographical districts for representation instead of the previous seven (7). The new district, No. 5. the Mid-Central Area, is composed of Pennsylvania, (previously in the New York Area group) and Ohio and West Virginia (formerly in the East Central group).

#2, NEW YORK AREA

New York, New Jersey

SIMON ASKIN
Heyden-Newport Chemical Corp.
New York, N.Y.

W. WARD JACKSON
Commercial Solvents Corp.
New York, N.Y.

DR. DONALD B. KEYES
Nat'l Ass'n of Mfgrs.
New York, N.Y.

SIDNEY D. KIRKPATRICK
Chemical Engineering
New York, N.Y.

COL. SELIG J. LEVITAN
Attorney
New York, N.Y.

#3, EAST CENTRAL AREA

Dist. of Columbia, Delaware, Maryland, Virginia

DR. PER K. FROLICH
Chemical Corps
U.S. Army
Washington, D.C.

DR. WENDELL F. JACKSON
E. I. duPont de Nemours & Co.
Wilmington, Del.

MAJ. GEN. C. E. LOUCKS
USA (Ret.)
Nat'l Paint, Varnish & Lacquer Assn.
Washington, D.C.

MAJ. GEN. W. N. PORTER
USA (Ret.)
American Cyanimid Co.
New York, N.Y.

FORCES CHEMICAL ASSOCIATION

1960

#4, CENTRAL AREA

Michigan, Indiana, Illinois,
Wisconsin, Minnesota, Iowa, Missouri

DR. LELAND I. DOAN
Dow Chemical Co.
Midland, Mich.

G. M. GLIDDEN
Acme Protection
Equipment Co.
South Haven, Mich.

LEWIS I. TERRY
Dearborn Chemical Co.
Chicago, Ill.

#5, MID-CENTRAL AREA

Pennsylvania, Ohio,
West Virginia

RAYMOND H. ARMOR
Diamond Alkali Co.
Cleveland, Ohio

CLAUDE H. ALEXANDER
B. F. Goodrich Chemical Co.
Cleveland, Ohio

W. T. COFER, JR.
Mine Safety Appliances Co.
Pittsburgh, Pa.

COL. WILLIAM J. ALLEN, JR.
Rocky Mt. Arsenal
Denver, Colo.

#7, WESTERN AREA

North Dakota, South Dakota, Nebraska,
Kansas, Oklahoma, Texas, Montana,
Wyoming, Colorado, New Mexico

#6, SOUTH CENTRAL AREA

North Carolina, South Carolina,
Georgia, Florida, Kentucky,
Tennessee, Alabama, Mississippi,
Arkansas, Louisiana

COL. JOHN M. PALMER
CmlC Training Command
Fort McClellan, Ala.

C. J. MAUPIN
Pine Bluff Arsenal, Ark.

#8, PACIFIC AREA

Arizona, California, Idaho, Nevada,
Oregon, Utah, Washington

PATRICK J. MORAN
Menlo Park, Calif.

MIDWEST CHAPTER TOLD OF ROLE OF CHEMICAL CORPS

More than 260 persons, including Chapter members, Reserve officers in the Chicago area, and their wives attended the dinner meeting of Midwest Chapter, held at the Officers Club, Headquarters, Fifth Army, Chicago, Ill., April 23, 1959.

A social hour and reception preceded the meeting, at which Major General Marshall Stubbs, Army Chief Chemical Officer, was the guest speaker. His subject was "The Chemical Corps' Role in National Defense."

Other features of the meeting included the presentation of the Midwest Chapter's Outstanding Achievement Certificate to Sgt. Edwin P. Metke, of the 379th Chemical Company, Bryn Mawr Training Center, U.S. Army Reserve, Chicago. This award was initiated by the Chapter in 1958 and is presented annually to the outstanding enlisted reservist in the XI Army Corps. The presentation was made by General Stubbs.

Also honored at the meeting was Chief Warrant Officer John A. Maylunas, Chemical Headquarters, 5th U.S. Army, retiring after twenty years of service.

In the absence of Chapter President, Gaillard Rumford, who is in South America on business, Mr. Hoyt M. Corley, First Vice President presided.

ROCKY MTN. CHAPTER OFF TO NEW START HEADED BY ALLEN

Colonel William J. Allen, Jr., Commanding officer of Rocky Mountain Arsenal, Denver, Colorado, was elected president of the Arsenal Chapter of A.F.C.A. at a "rejuvenation" meeting there on April 20. Despite severe weather some 60 members and guests attended.

Other newly elected officers are: Mr. K. C. Clifton, first vice-president; Capt. A. W. Spigarelli, second vice-president; and Capt. Joseph K. Paull, secretary-treasurer.

Guest speaker at the meeting was Brigadier General Clifford L. Sayre, A.F.C.A. president. Among those attending were two retired brigadier generals, who formerly served in the Chemical Corps: C. S. Shadle and J. H. Rothschild.

General Sayre, who is Director of Central Engineering of Food Machinery & Chemical Corporation, upon his return to New York, wrote Colonel Allen:

"After my busy traveling schedule in the West, I now have a little time to stop and express my appreciation to you and your R.M.A. colleagues for the splendid reactivation meeting we had on April 20. I feel very certain that you are off to a good start and I have the impression that the industrial representatives in Denver are completely behind you in this effort. . . ."

Sixty-two (62) membership applications have been received by this chapter since reactivation began several months ago.

A dinner meeting was scheduled by Rocky Mountain Arsenal Chapter for the evening of 18 June 1959, with Dr. Harold C. Weber, Chief Scientific Advisor, U.S. Army, as the guest speaker.

CHESAPEAKE CHAPTER ELECTS

EDGEWOOD, MD. — Mr. George L. Cole of Baltimore, a member of the Logistics Management Board at Army Chemical Center, was elected president of the Chesapeake Chapter of the Armed Forces Chemical Association at its May meeting at the John Hasslinger Restaurant in Baltimore.

Featured speaker at the dinner was Paul Iribe, of the Westinghouse Astronautics Institute, who discussed a number of space age advances of interest to the group.

Prior to the evening meeting, the group toured the Western Electric Point Breeze plant near Baltimore. Major General Marshall Stubbs, Army Chief Chemical Officer, was guest of honor at the day's activities.

Frederick C. Lange, of Continental Can Company, was elected executive vice-president. Other vice-presidents are: Alfred C. Benson, membership; Miles B. Hopkins, programs; Paul D. Olejar, publicity; and James P. Cannon, industrial relations.

William H. Shearin and R. S. Bailleul were elected secretary and treasurer, respectively.

Major General Marshall Stubbs, Chief Chemical Officer (right), hears Western Electric's Robert D. Lilley describe the workings of a plastic conveyor system used in the Western Electric Point Breeze plant, near Baltimore. General Stubbs accompanied the Chesapeake Chapter of the Armed Forces Chemical Association on a recent tour of the plant. At left is Major Bernard Allen, Chemical Corps assistant executive officer.

MR. WANSKER AT NATO MEETING

Mr. Harry A. Wansker, a vice-president of A.F.C.A., and president of the New England Chapter, was one of the delegates attending the NATO Atlantic Congress in London during June.

This gathering, which brought together representatives from all NATO countries, was concerned with the furtherance of NATO interests, particularly Article II of the NATO Treaty, which pertains to cultural matters.

While not official, the meeting was supported by participating governments and its deliberations were regarded as of much significance.

Mr. Wansker has been very active in promoting Article II aspects of NATO affairs in the New England area.

CHEMICAL CORPS TEAM TEACHES RADIOLOGICAL SAFETY MEASURES IN CASE OF A NUCLEAR WEAPON ACCIDENT

FORT MCCLELLAN, ALA.—A two-man travelling team of radiological experts has been organized at the Army Chemical Corps Training Command, here to teach Army personnel how to protect persons from radioactive contamination which might result from a nuclear weapon accident.

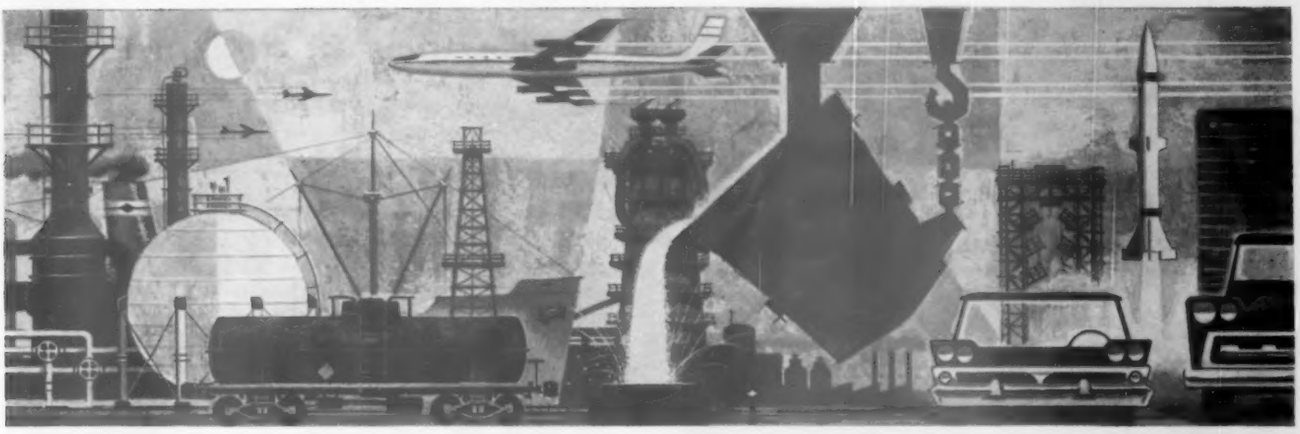
The team was organized early this year and started on a six-weeks trip throughout the First, Second, Fourth, Fifth and Sixth Army areas, to give existing emergency units a 16-hour course in the detection and monitoring of Alpha radiation. They had previously given such instruction at Ft. McClellan for Third Army personnel. Under the Army plan for coping with nuclear accidents, specially qualified emergency units have been established in each of the six Army Commands in the United States.

The course covers such subjects as the basic nature of radioactivity, standards of protection against radiation, radiac instruments, monitoring procedures and related topics. A major subject is the use of the JUNO radiation survey meter which is capable of detecting all three types of radiation, alpha, beta, and gamma.

Among the major problems associated with handling nuclear weapons is the protection of personnel against possible radioactive contamination in case of accident. Nuclear weapons are designed for the maximum of safety in handling and shipping, and it is considered that the possibility of accidental nuclear explosion is so remote as to be negligible. The two most likely hazards, when weapons are involved in accidents, such as wrecks or fires, are detonation of the conventional high explosives they contain, and the possible presence of alpha radiation such as could occur with scattering of the plutonium. This contamination is an internal hazard only and must be inhaled or ingested to present a hazard to personnel.

The team is composed of First Lieutenants George F. Winterson and William E. Twaler, who are assigned to the First Radiological Safety Support Unit, a special unit in the Chemical Corps Training Command. Lieut. Winterson, a 1956 graduate of Massachusetts Institute of Technology, served as chief of the Radiological Survey Center for Fort Campbell's recent "Operation White Cloud" tactical exercise. Lieut. Twaler graduated from De Paul University, Chicago, Ill., where he majored in mathematics, and participated in last summer's "Operation Hardtack" at Eniwetok Proving Ground. Prior to the tour they had already instructed a nucleus of Third Army area officers, and enlisted men at Fort McClellan.

The Nation's Top **100** Industrial Corporations All Use Harshaw Chemicals



For each of 50 different industries, including the Nation's top 100 industrial corporations, Harshaw produces a variety of important chemicals. For instance, the Petroleum Industry regularly purchases catalysts, metallic soaps, salts and crystals. The Automobile Industry buys electroplating chemicals and anodes, catalysts, fluorides, pigments and metallic soaps. The Chemical Industry uses products from six of our ten industrial divisions.

Harshaw produces over 1000 different chemicals for more than 15,000 customers throughout the World. *Probably we have a chemical you can use.* If you have something specific in mind ask us. At your request we'll forward a catalog listing our major products and describing our company.

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HARSHAW

DONALD MacARTHUR
Meetings Committee Chairman

PLANNING FOR A. F. C. A.

14th ANNUAL MEETING

THE STATLER HILTON
WASHINGTON, D.C.
SEPTEMBER 10-11, 1959

ARRANGEMENTS are nearing completion for the 14th Annual Meeting of the general membership of A.F.C.A., which will be held at the Statler-Hilton Hotel, in Washington, D.C., on September 10-11.

"Host Service" for the meeting this year, in line with the Association's Service rotation policy, is the United States Navy. Accordingly, the program for the meeting will hinge largely on naval aspects of the applications of chemistry to National Defense.

Tentative plans provide for a program consisting mainly of Service presentations during the morning period of each day—probably until 1 p.m. Each afternoon of the two-day session will be devoted to a visit to one of the nearby naval technical installations. These are of very considerable importance, and, it is believed, these visits will prove of much interest and value to the attending members and guests.

L. DOUGLAS WEIFORD

On the afternoon of September 10 the program calls for proceeding by bus to Anacostia in Southeast Washington for a visit to the U.S. Naval Research Laboratory. This laboratory carries on work in both chemical and physical fields, and the Committee believes a visit there will prove of much interest to the visiting members.

ADM. MARTIN P. HOTTEL

Similarly, on the afternoon of September 11, a visit will be made to another Naval installation, the David Taylor Model Basin. This is built over the old Washington B&O Canal. Tests are made there of scale-model vessels in the Navy's development program, and materials development tests are also conducted.

Among the subjects which, in accordance with present plans, will be dealt with in the naval presentations during the sessions at the Statler are the following:

High Energy Fuels (solid); High Energy Fuels (liquid); High Temperature Lubricants; Hydraulic Fluids; Chemicals to be used after atomic attack; and Plastics.

In addition to the naval presentations, it is expected that there will be one or more addresses from representatives of the Army and the Air Force. As usual, regardless of which of the three Armed Services occupies the role of "Host Service" at an annual meeting, it is expected also that contributions to the program will be made by the U.S. Army Chemical Corps.

CARROLL W. HAYES

Supplementing the addresses and discussions at the Hotel Statler, there will be exhibits by the Navy, and possibly also by the other two Armed Services.

Tentative plans provide for separating the usual combination of the President's reception and cocktail party and the annual banquet on the last evening of the meeting. This year the Committee is planning to have the reception and cocktail gathering on the night of September 10. This will insure adequate time on the evening of the 11th for the members to return from their visit to the Model Basin and prepare for the banquet gathering. The

MARVIN MARCUS

Committee is not ready as yet to announce the names of the banquet speaker and the others who will address the meeting.

Acceptance by the Navy of the role of "Host Service" has been received by President Clifford L. Sayre in a gracious letter from The Honorable C. P. Milne, Assistant Secretary of the Navy for Materiel.

Letters from President Sayre, requesting participation in the program by their departments, have also been sent, respectively, to The Honorable Neil H. McElroy, Secretary of Defense; The Honorable Wilber M. Brucker, Secretary of the Army; and The Honorable James H. Douglas, Secretary of the Air Force.

The Committee in Charge, together with the naval group assisting, are considering as a slogan for the meeting, a formula:

$$A + B + C = D,$$

where A stands for Armed Services, B for Budget, C for Chemistry—all adding up to D, which means National Defense.

Mr. Donald MacArthur, general chairman of the Committee on Arrangements for the meeting, is Vice President of A.F.C.A., and Chairman of Meetings Committee of the Association. Mr. MacArthur is the Manager of the Washington, D.C., office of Koppers Company, Incorporated. Assisting him are a number of special sub-committees, with chairmen as listed below:

Program Coordination—

Mr. L. Douglas Weiford, Manager of the Washington Office of Stauffer Chemical Company. Mr. Weiford is President of the Washington Chapter of A.F.C.A.

Programs and Advertising—

Rear Admiral Martin P. Hottel, USN Retired, Manager of the Washington Office of National Lead Company.

Arrangements—

Mr. Carroll W. Hayes, Manager of the Washington Office of Celanese Corporation of America.

Exhibits—

Mr. Marvin Marcus, Sales Manager of Government Operations, The Lummus Company, and Special Representative of Combustion Engineering Company in Charge of Nuclear Work.

President Sayre, as well as Vice-President MacArthur and all others concerned with the program planning are appreciative of the extensive assistance which has been and is being rendered on arrangements for the meeting by Commander S. H. Hanson, USN, Office of Naval Materiel. Commander Hanson is the regularly assigned Liaison Officer from the Navy to the A.F.C.A. Headquarters.

Likewise, the Association is appreciative of the assistance of Major R. J. McNicholas, USMC, Headquarters, U.S. Marine Corps, also on the list of Liaison Officers to the Association, and Commander D. D. Overby, USN, Office of Naval Information, who has been designated Project Officer in connection with the program.

In addition to the official list of events, the Committee notes that in holding the meeting this year at the Statler Hotel, having a central location, scarcely more a a few good wood-shots from the Washington Monument, the members will find other attractions of the Capitol City close at hand. In that connection, Chairman MacArthur notes, with much interest, that the "Washington Senators" are scheduled for a ball-game in Washington on the night of September 10 with the "Chicago White Sox."

Chairman MacArthur states that the Committee, as in the past, plans to distribute an advance bulletin containing the program and registration form. These will be mailed out to all members well before the meeting.

Sixteenth Street View of Statler-Hilton Washington, D.C.

GEORGIA TECH CHAPTER VISITS CHEMICAL CORPS AT McCLELLAN

FORT McCLELLAN, ALA.—More than 40 Chemical Corps cadets from Georgia Institute of Technology visited the U.S. Army Chemical Corps Training Command on April 24-25. The students, who came to Fort McClellan to obtain first-hand knowledge of the Chemical Corps, also represented the Georgia Tech Chapter of the Armed Forces Chemical Association. The group was accompanied by Major Robert K. Bradford, Assistant Professor of Military Science and Tactics at Georgia Tech and faculty advisor for the Armed Forces Chemical Association chapter, and Captain James E. McKenzie of the Chemical Corps staff at Georgia Tech.

During a dinner at the Officers' Club, the students were welcomed by Colonel John M. Palmer, Commanding Officer of Chemical Corps Training Command, and Colonel Carl V. Burke, Commandant of the Chemical Corps School.

On the following day the students visited different activities and facilities of Chemical Corps Training Command and received briefings on chemical gas alarms, detector kits, and other items of Chemical Corps equipment. After touring of the School, the group of students reviewed troops of the 100th Chemical Group at Bullene Field; from there they were flown by helicopter to Unmacht Field, where they observed a chemical munitions demonstration.

Dwight Bronnum (left) and Marion Clark (right), two of the more than 40 Georgia Tech R.O.T.C. cadets who visited the U.S. Army Chemical Corps Training Command facilities during April, are incoming and retiring presidents respectively of the Georgia Tech Armed Forces Chemical Association chapter. With them are Major Robert K. Bradford (second from left), who accompanied them from Georgia Tech, and Col. Carl V. Burke, Commandant of the U.S. Army Chemical Corps School.

DYLITE® PRODUCTS

INSULATED DYLITE CUP FOR THE DISPENSER INDUSTRY

This is Thermokup*—a throw-away plastic cup that insulates like a vacuum bottle, yet is only 1/10 of an inch thick. Because this cup is made of DYLITE, hot beverages stay hot and cold beverages stay cold longer. More important, you can hold Thermokup comfortably in your hand with almost no sensation of heat or cold. DYLITE is also used widely in the refrigeration and air conditioning fields, because it has superior moldability, a low rate of water vapor transmission, and possesses a K Factor of 0.242 at 2 lbs./cu. ft. density and a 75°F. mean temperature.

Thermokup Molded by:
Mid-West Pak Corporation, Belvidere, Illinois
Crown Plastic Cup Company, Fort Worth, Texas
Polychemical Industrial Ltd., Edmonton, Alberta, Canada
Patents applied for by: Crown Machine & Tool Company, Fort Worth, Texas

**Trademark of Crown Machine & Tool Company, Fort Worth, Texas*

STRONG, DYLITE-MOLDED CHAIR FORMS FOR THE FURNITURE INDUSTRY

Molded DYLITE plastic forms are now being used as the basic structure for this modern-styled Futorian Chair. It is one of the newest innovations in upholstered furniture. Why? Because the entire frame is molded-to-shape in a single operation. The chair itself weighs between 25 and 30 pounds; a similar chair with a wood frame would weigh more than 80 pounds.

Here are some of the reasons why DYLITE was chosen: DYLITE is stronger than wood; it is more economical to use; it is 66% lighter than the material previously used; it is shock-absorbent and warp-resistant. More important, it gives the designer additional creative freedom, and allows him to design shapes and sizes that were previously impractical. Because DYLITE is dimensionally consistent, there is no variation from frame to frame—all covers can be pre-cut and pre-sewn.

Chair manufactured by: Futorian-Stratford Furniture Co., Chicago, Illinois

LIKE TO LEARN MORE ABOUT DYLITE?

If you'd like to get more information about DYLITE expandable polystyrene, and how it may help to solve one of your problems, write now to Koppers Company, Inc., Plastics Division, Dept. AF-79, Pittsburgh 19, Pennsylvania. We'll be glad to answer your questions, and offer technical assistance.

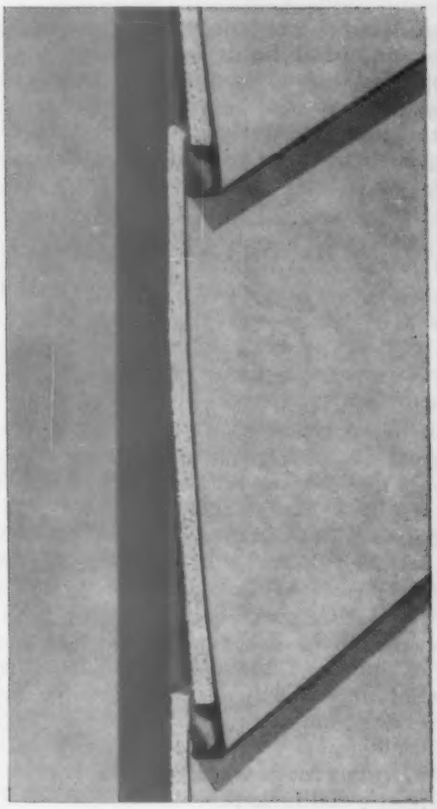
MAKE NEWS
IN FOUR MAJOR INDUSTRIES

SHOCK-ABSORBENT DYLITE COCOON FOR THE PACKAGING INDUSTRY

Normally, it takes time to prepare a typewriter for shipment! At Royal McBee Corporation, this job used to require heavy slabs of cardboard and yards of tape, cord and wire—and lots of expensive time preparing each machine for shipment. But, now Royal Electric Typewriters are packed and shipped in 3½-pound DYLITE foam cocoons.

This new DYLITE pack offers shock-resistant protection, thanks to two characteristics: shock absorbency and moldability. DYLITE molds to fit the intricate contours of odd-shaped products, such as typewriters, thus holding movable parts firmly in place. The new DYLITE pack cuts shipping costs since it weighs only one-third as much as the old container; and its simplified design has reduced handling time four and a half minutes. DYLITE's unique combination of properties makes it highly suitable for industrial or consumer-type packages.

Cocoon package molded by: Worcester Moulded Plastics, Worcester, Massachusetts



LIGHTWEIGHT DYLITE-BACKED ALUMINUM SIDING FOR THE BUILDING INDUSTRY

Because it has a bonded DYLITE backing, three-eighths of an inch thick, this colorful aluminum lap siding has three times the insulation of wood. Since DYLITE is lightweight, it is a simple task for one man to install these aluminum panels. Moreover, DYLITE is strong, low cost and water-resistant. It will not warp or rot. It is safe from vermin and mildew damage. These aluminum panels meet F.H.A. Specifications. DYLITE also has proved to be an outstanding vapor barrier around perimeters and slabs and in crawl spaces.

Aluminum Siding by: ALSCO, Inc., Akron, Ohio

Offices in Principal Cities · In Canada: Dominion Anilines and Chemicals Ltd., Toronto, Ontario

KOPPERS PLASTICS

KOPPERS

THE CHEMIST AND NATIONAL DEFENSE

MAJOR GENERAL MARSHALL STUBBS

Buck Rogers-like space equipment, air jeeps to move in any direction, battlefields in constant motion! Through chemistry, these and other seemingly fantastic ideas in today's military thinking may well be realities tomorrow! Herewith, a condensation of the imaginative and forward-looking address to the American Institute of Chemists in Atlantic City on May 7 last by—

MAJOR GENERAL MARSHALL STUBBS
Chief Chemical Officer, U. S. Army

"In this complex era of unprecedented technological progress and of intricate political problems, the future belongs to those who refuse to be awed by its difficulties and resolutely accepts its challenges."

This statement was made by Army Chief of Staff General Maxwell D. Taylor in a message to members of the Association of the United States Army at its annual meeting last October.

General Taylor said further that "the over-all objective of the Army, today and for the future, is to contribute to the security of the Nation as a member of our tri-Service team by providing ready forces for sustained land combat in any type of conflict, any place, any time."

You, in this room, will have a lot to say and do about the Army's ability to provide such forces. You will also have a lot to say about whether the Navy and Air Force can meet these challenges on the sea and in the air.

Chemistry has figured largely in the evolution of the modern military aircraft, the atomic submarine and the fire power of today's Army.

The mobility of our armed forces, the weapons they use, the food they eat, their health and comfort, and the clothes they wear depend upon the achievements of the chemist and the chemical industry. . . .

It would be physically impossible to recount here all the ways in which National Defense is dependent upon the chemist, the chemical engineer, and all of the subfields of chemistry.

In preparing for this talk, I had before me a compilation of Army research projects in chemical fields for 1959. It is a book nearly one inch thick. It runs the gamut of chemical research. Many of these are problems of pressing current need. Others are for the future. Many are basic research projects, hunting for breakthroughs in present knowledge. As with so many military projects, the end results will in many cases not only strengthen defense, but will eventually find their way into everyday applications in civilian life.

We had ample evidence of the importance of chemicals to national security in the last World War. You would be called upon for even greater contributions if there should be another war. Since the last one we have become more and more dependent upon the technological developments that emerge from your laboratories. If man should conquer space, you will share a large part of the credit. And it is entirely possible that through chemistry we may eventually succeed in making war impossible, or at least highly unprofitable for aggressors.

Any research in chemistry and all of the sciences is directed toward increasing the amount of firepower that can be brought to bear on the enemy with the fewest number of men, in the least possible time, with least amount of hazard to our troops, and with the least amount of effort. That is a large order in a small package. . . .

If we can provide all of these things in a high degree of technological perfection to our troops, what would a Space Age soldier look like?

A concept of this super-trooper of the future has been vividly described by Major General Harry W. Johnson, the Army's chief for combat developments. He said that all of the proposed Buck Rogers-like equipment that he described had been found completely feasible by Army officials.

The Space Age soldier, he stated, will be wearing clothes for protection against any kind of attack. He will go over obstacles and jump ditches with a boost from a rocket belt strapped on his back. He will move, almost effortlessly with the aid of zero ground pressure creeping boots. He will carry a light, all-purpose super gun and 150 rounds of ammunition. He will wear headgear, much like a football helmet, equipped with a tiny, individual radio, effective at ranges well over 1,000 yards. The helmet will have a removable front panel which, when in place, will protect him against chemical, biological, and radiological attack.

If the soldier needs shelter in a hurry, he will strip a pencil-like automatic foxhole digger from his suit, ram it into the ground, detonate it, and jump into the hole it creates. He will probably travel in air jeeps—saucer-like vehicles which can move easily in any direction, or hover motionless in space. He will eat meals of irradiated food, carried in a small, flat pack.

This concept is not far-fetched. Some of these things are just around the corner. Others are in the prototype stage. We don't yet have the zero ground pressure boots and some of the other more imaginative devices, but I am a firm believer in the principle that what a man can conceive, he can achieve.

The Army is conceiving new needs every day. Now they seem fantastic, but the fact that we can conceive them means to me that in time we can achieve them. . . .

The battlefield in the next war will be spread out, and

in constant motion. Troops will have to keep moving and be well dispersed. This means that reliable methods of communications will be necessary, which will not be dependent on telephone wire. We will need new and better power units not presently available to power such communications. The Army will need compact power packages which can be moved around the battlefield quickly. . . .

Batteries may provide a solution to this problem. Real progress is now being made in a hitherto neglected field. The Army's intense interest in the development of more efficient batteries is revealed in the fact that the Army Signal Corps alone has nearly 20 research projects under way. . . .

The Army has a big stake in the development of fuel cells. The Ordnance Corps, Corps of Engineers, and Signal Corps are working together in this search for a new energy source for both large and small applications.

The fuel cell is by no means a new development, as all of you know. As a matter of fact, interest in fuel cells was generated over 150 years ago in an effort to find means of burning coal electrochemically in a battery at a higher degree of efficiency than possible with conventional heat engines. There are many difficulties to overcome, but there have been promising developments, some of them very recent.

If the Army is successful in its efforts, this new energy source may help dispel a major problem of logistics. Gasoline is still the best possible fuel for use on the battlefield, but since 60 per cent of the tonnage required for combat operations is in fuels, we must seek something better. . . .

On the general subject of the hunt for energy, Dr. Roy W. Johnson, Director of the Advanced Research Projects Agency of the Department of Defense, has stated "there is much work to be done across the board in the energy field." From the Defense Department's and the national point of view, the need for power systems from watts to megawatts is foreseen. Some of these, he stated, will be chemical, some solar, some nuclear, and other types. In all of them low weight, long life, and good efficiency will be needed.

Most of the Army technical services . . . have major problems in the field of chemistry.

In the Corps of Engineers, for example, chemistry plays an important role in the study of surface tensions and adhesion of ice and snow in the Arctic and Antarctic regions. In the construction of runways, Army Engineer chemists seek to solve the problem of iced runways to improve runway uses and flight operations. They hope to find a better method or improved material to reduce ice conditions on airfields in the polar regions.

Experiments are also being conducted to determine whether with the addition of certain gases, snow can be made into a more pliable building material. . . .

Chemical treatments and chemical compounds are used to develop supplies and equipment designed to protect the soldier against enemy weapons and other hazards of the battlefield. Chemicals are applied to clothing and equipment for protection against the extreme cold and high winds of the Arctic, against the heat and humidity of the tropics, the sun and hot sands of the desert, and the cold-wet winters of the temperate zone.

Chemistry is used in the development of special protective clothing for special occupations, such as fighting fires and handling the fuels used for guided missiles. Chemistry has application in the development of materials to contain and carry liquid fuels under high and low temperature extremes and in research for new and better materials to cushion air-dropped military supplies. Chemistry supports the Quartermaster program to improve the variety, acceptability, packing, packaging, and serving of military rations. . . .

The Army Chemical Corps lives on chemistry in all of its forms. In our laboratories we are fortunate in having many top flight chemists and chemical engineers, many of whom I am sure you know.

One part of our research work is concerned primarily with substances that affect bodily mechanisms in varying degrees. We also must develop methods of protection against such substances. . . .

We are striving for a constant input of ideas and concepts, both from within the Corps and from industry, universities and research organizations. We need new and novel ideas that are applicable to our field of interest, and we want them before they have been laboriously perfected. . . . We must close the time gap between the birth of an idea and its translation into reality.

One of our big problems is to so equip our fighting men that they would be impervious to a chemical and biological attack and would be so unencumbered that they could effectively continue their mission.

We are concerned with developing more adequate and more rapid early warning systems that will detect a chemical or biological attack. Since many chemical and biological warfare agents cannot be detected by the senses, it is imperative that simplified methods be devised that would give us early warning of such an attack.

We are aware of the recent developments of physiologically active materials that might be used by an aggressor to stifle the will to fight of his opponent's armies. We must have your cooperation in studying this development.

We run into many complex problems in our search for methods of giving our troops complete protection. For example, complications arise when man attempts to protect his skin from toxic agents. Plain sweat is one of these problems. Any protective barrier interferes in some degree with the evaporation of sweat. Substantial effort has gone into the development of a clothing material that would prevent penetration by toxic agents and still permit the evaporation of an adequate amount of sweat. . . .

The Chemical Corps is working with the Quartermaster Corps in the search for lighter body armor materials that will give a higher degree of protection for the amount of weight involved. . . .

A recent chemical industry publication estimated that 50,000 compounds are prepared and studied by chemists every year. Most will never get out of the laboratory, and on the other hand many will. . . .

I should like to put in a bid for the compounds that don't get out of the laboratory. The Chemical Corps is avidly interested in the things that you find in your laboratories that may have no immediate use. We must be especially alert to study materials that an enemy can use to produce physiologically adverse effects. . . . These include:

1. Adverse physiologically active compounds including those having a high degree of effect; and those having a marked convulsant, sedative, or incapacitating action with a lesser degree of effect.

2. In the second general area are those compounds which have therapeutic or prophylactic value. This group covers the whole range of interest concomitant with the effects of chemical warfare agents.

3. The third general area of interest consists of those substances, compounds or mixtures having specialized properties such as: gelling, thickening, incendiary, decontaminating and smoke producing.

4. The fourth and last area involves the detection of

chemical warfare agents and nuclear radiation and the protection and decontamination of personnel or material exposed to their effects.

The information received from industrial laboratories is protected with the utmost care. All rightful interests of participants in the program are respected to the fullest degree, including all patent rights.

You can strike a quick blow for national defense by your contributions to this program. . . .

We cannot stockpile all the things we need. We cannot stockpile technology in the sense that we can place it on the shelf and leave it there. Technology can get old just as shelf-items succumb to the aging process. What is new today may be obsolete tomorrow in this fast-moving world in which we are living. These are things you know. The chemical industry is alive and growing and should we be forced into another war, we can take hope that we have such strength at hand.

CONGRESSIONAL COMMITTEE HEARING ON CBR

Step-up in research and public education programs advocated in statement by Chairman Brooks of House Committee on Science and Astronautics, following appearances before the Committee by Generals Creasy and Stubbs. Press release, dated 22 June 1959, follows:

CHAIRMAN OVERTON BROOKS (D-La) announced today that the Committee on Science and Astronanutics met this morning in executive session with Major General Marshall Stubbs, Chief Chemical Officer, U. S. Army, and his staff for a discussion of current developments in chemical, biological and radiological warfare. This meeting was a follow-up to the open session on June 16 at which Major General William M. Creasy, former Chief Chemical Offiicer and now in private industry, focused attention on the new wonder psychochemicals which may add a new dimension to warfare.

Mr. Brooks said, after the closed-door session, "This Committee already had some general appreciation of the importance of chemical, biological and radiological warfare. General Creasy's testimony last week opened our eyes to the rapid changes in possibilities which are coming in this little understood field. Today, General Stubbs gave us chapter and verse of the stark realities. I know that I speak for the Committee when I say the Congress and the people at large must be told enough of these dangers that sufficient protective measures are taken to ensure our survival in case these weapons are used against us both on the battlefield and in our civilian population.

"The United States and its allies face a very real and very grave threat from chemical, biological and radiological weapons which the Soviet Union is capable of using against us either in connection with a nuclear attack or in limited war or in covert operations.

"The new weapons have tremendous versatility, even if they are a complement to nuclear weapons rather than a substitute for them. They can be used selectively to kill with terrible efficiency or to weaken and confuse a military force, or to incapacitate only temporarily with no serious after effects. This selectivity is why General Creasy referred to them as "humane" weapons. War is not a humane activity. Death by chemical, biological or radiological means is neither better nor worse than death by other means of warfare. Even temporary incapacitation of our forces by the enemy, if it resulted in loss of a war, would bring just as serious slavery as would the loss of any other modern war of the "total" character. However, General Creasy is right in calling certain agents "humane" if incapacitation in some situations would avoid the use of more drastic weapons.

"The United States does not seek to use such weapons any more than it does nuclear weapons, but unless it has explored their potentialities, knowing full well that Soviet efforts in this regard have been very great, it would be guilty of a great disservice to all of the free world as well as risking its own destruction.

"Civil defense is not a substitute for the nuclear deterrent. Gas masks will not take the place of missiles. But unless the armed forces and the civilian populations of the free world receive protective equipment, and unless research efforts to understand these new weapons are stepped up, we could readily succumb to a Soviet attack of this nature. We must push harder our present small-scale efforts in chemical, biological and radiological defense. Let no one be fooled that our failure to do so will remove the problem from the world scene, or that the Soviet Union will refrain from using such weapons any time it feels it would be to its advantage.

"The Committee was reminded by one of its own members that the present effort on chemical, biological and radiological weapons, including their defense, represents only about one-thousandth of the national defense budget. This seems pitifully small in light of the potentialities of these agents. This is not an amount likely either to protect the free world against the effects of their use or to create a deterrent capability to discourage Soviet employment of such agents in any unsought future conflict.

"The Committee had the gripping experience of seeing an actual demonstration of some of the new experimental incapacitating agents. It was all too easy to imagine the conclusive effect employment of such agents against our forces would have in battle, or if such agents were used covertly against the personnel of our air defense emplacements here at home. To relieve the minds of the public, the animal subjects used before the Committee were in no way permanently harmed even though they suffered almost immediate temporary body paralysis. The consequences for the Nation, however, if we let down our defenses, would be something else again.

"We call upon the Department of Defense and the OCDM to begin a more vigorous campaign of education of the public in order that protective measures can be taken, and that a faster-moving program of research can receive the support it deserves. Even a tripling of funds for chemical, biological and radiological warfare research would be a very modest investment of only a third of one percent of our total military budget, and would be well worth the cost in light of the potentialities."

IN PRAISE OF SWEAT

By F. N. Craig

Applied Physiology Branch

U.S. Army Chemical Warfare Laboratories

The word sweat has an unpleasant connotation for several reasons including its onomatopoetic quality and its association with the laborious consequences of original sin (Genesis 3:19). The unfavorable popular view of sweat extends to the image of the scientist engaged in studying the physiology of sweating, held up to scorn in the character of Shearwater in Aldous Huxley's "Antic Hay." On the other hand, sweat makes it possible for dwellers on Earth to venture forth from an air-conditioned shelter in warm weather. Although the body temperature of a healthy man varies more widely from the 98.6°F. mark on our clinical thermometers than is generally supposed, he cannot function long at a body temperature above 104°F. How then can he live in the Persian Gulf region where temperatures in the sun may reach 160°F. or at Dugway Proving Ground in Utah, where air temperatures of 95°F. and ground temperatures of 125°F. are encountered in the summer? An inanimate object soon attains the temperature of its surroundings in accordance with Newton's Law, which states that the flow of heat from one object to another is governed by the difference in temperatures between the objects. A man, however, is generating heat in his metabolism at a rate of about 80 Calories per hour at rest and several times as much in work.

In environments cooler than the human body, heat is lost by conduction, convection and radiation to the extent that insulation in the form of clothing may be required to prevent excessive loss of heat. In warmer environments a man absorbs heat from his surroundings in addition to what he generates in his vital activities.

Sweat, then, is the answer. When the skin temperature exceeds 90°F., the sweat glands for some unknown reason begin to pour out their watery fluid, and the higher the temperature, the more sweat is produced. If circumstances are favorable, the water in the sweat evaporates from the skin, absorbing in the process about 0.58 Calories per gram. Favorable circumstances are air movement and absence of clothing. Other things being equal, the rate of evaporation is proportional to the vapor pressure gradient between the skin and the surrounding air. The vapor pressure of water in the air is the controlling factor here rather than the relative humidity. That is, at the same skin temperature sweat can be evaporated into the air at 75°F. and 50% R.H. as easily as at 110°F. and 20% R.H. If the skin is covered with clothing, however, relative humidity becomes important because this factor affects the regain of moisture by textile fabrics. Dry clothing retards the escape of water vapor from the skin. When it has become wetted out, clothing lowers the efficiency of heat loss by evaporation for evaporation then takes place at the surface not of the skin but of the clothing. Because of the insulation of the clothing some of the heat of evaporation is drawn from the environment as well as from the body. Those interested in this complicated subject are referred to an excellent treatment of it by Burton and Edholm.(1) Nevertheless, the potentialities of heat loss by evaporation are so great that a wide range of human activities can be carried on in the sun in hot climates without an excessive increase in body temperature.

When man attempts to protect his skin from toxic agents, however, complications arise. Any protective barrier interferes in some degree with the evaporation of sweat. The impermeable rubberized suit represents the limiting case. In an environment at the same temperature as the body a man could remain in the suit until he had stored about 80 Calories, or for one hour at rest or less depending on the degree of activity. Some benefit can be obtained by evaporation from a wetted cover outside the impermeable layer or by ventilating the suit with filtered air. A substantial effort has gone into the development of a clothing material that would prevent penetration by toxic agents and still permit the evaporation of an adequate amount of sweat, but a practical material is still to be found. Considerable success in the protection against certain agents such as mustard gas, has been achieved by impregnating ordinary permeable clothing with reactive substances in such a way that heat loss by evaporation is hampered to only a slight extent.

Evaporation of sweat must be provided for in collective as well as individual protective systems. In the conventional power-driven collective protector, enough air can be filtered to facilitate evaporative heat loss. In the newer protective shelters dependent upon diffusion for exchange of the oxygen and carbon dioxide in breathing, an adequate environment can be maintained in cool weather, but the problem of keeping the vapor pressure within the shelter low enough to permit the evaporation of sufficient sweat in hot weather requires further study.

Finally, it must be recognized that there can be too much of a good thing, even sweat. If circumstances are unfavorable to evaporation, sweat will remain in excess and as the body temperature rises, sweat will pour out at an increased rate. In this situation it is futile to blame the discomfort on sweat; the only remedy is to restore the heat balance.

(1) "Man in a Cold Environment," by A. C. Burton and O. G. Edholm, London, Edward Arnold, 1955.

WHAT'S IN THE WIND

By

Major John O. Wilson, V.C.

Students collecting sample of air to be tested for the presence of harmless BW-type micro-organisms. Officer in center is recording time, location and conditions when sample was drawn.

The best answer to this question might be, "More than you think! Definitely, this is the theme at the U.S. Army Chemical Corps School, where military personnel are being trained to detect the presence of biological warfare agents through the collection and processing of samples, including air."

The Biological Branch at the U.S. Army Chemical Corps School conducts a practical four-hour field and laboratory exercise in the collection of samples as an aid to the detection of the presence of living microorganisms which may have been disseminated in the employment of Biological Warfare. This exercise is part of the program to provide well-rounded training for members of the Armed Forces, who will have responsibilities in the areas of defense against Chemical, Biological, and Radiological weapons.

A general introduction into the technical aspects of Biological warfare, includes the nature of microorganisms, natural body susceptibility and resistance to infection, and possible means of dissemination of biological agents. The military student then is sent into an area in the field which looks as natural as any other section of the wooded hills found in northeast Alabama in the region of Fort McClellan, where the Chemical Corps maintains its School. But, prior to the arrival of the students, the area has been seeded with living microorganisms of a type not pathogenic, or disease-producing, for man; or improvised devices capable of disseminating these living organisms as an aerosol (the organisms are actually suspended in the air) have been emplaced in a concealed position in the area, in order to place these harmless organisms in the air when the "sampling team" is present.

The presence of these organisms cannot be detected by any of the five senses, and many of the students are skeptical as to their existence, particualrly in the living state—but, nevertheless, the student proceeds into the area to collect various types of samples, one of which is taken from the air by bubbling air through a small quantity of sterile distilled water. He may swab the underside of a leaf or the side of a building, or road sign, in the hope of collecting microorganisms which may be present there. (Picture No. 1). Or, suspicious of water supplies, he may collect samples of the clear, running stream which traverses the area. (He has always heard that water which

Student officer collects water sample to detect contamination with BW-type micro-organisms.

ABOUT THE AUTHOR

Major Wilson is presently senior instructor in bacteriology at the Technical Division of the U.S. Army Chemical Corps School, Fort McClellan, Alabama. He is a graduate of Ohio State University's College of Veterinary Medicine, and also holds a Master of Public Health degree from the University of Michigan. He was formerly veterinary supervisor with the Department of Agriculture of the State of New Jersey, and is a member of the American Veterinary Medical Association, and Alpha Psi, national veterinary professional fraternity.

Students transfer the sample to appropriate food materials for incubation and growth.

Students observe and record results of samples.

is clear and is running over sand, as this is, is safe to drink—so surely this water must be pure! (Picture No. 2)

The military student, although he is no longer sure that there was "*nothing* in the wind," is still not convinced that there was *something* in the wind." This leads him to the next step in handling the samples he has collected. Working in the microbiology laboratory, the student will transfer his sample material to a nutrient (food) substance so prepared as to support the growth of bacterial or fungal organisms upon incubation. (Picture No. 3)

Following a suitable period to allow for the growth of sample organisms, the student removes the test material from the incubator in order to observe results. The majority of students are amazed, but—"seeing is believing." Here before his very eyes is the evidence that there was "*something* in the wind." Students will record and tabulate their results, which most frequently will indicate that not only is the air capable of being seeded with living microorganisms, but that they also may be recovered from solid surfaces and water (Picture No. 4).

Following this training, incorporated as it is with many other practical exercises, the military student goes forth confident in his understanding of procedures that may one day prove vital to the defense of our Nation.

DETRICK SCIENTISTS RECOMMEND PLASTIC PETRI DISHES FOR SAFETY

Accidental dropping of Petri dishes containing cultures of bacteria can release particles which may make laboratory workers ill, according to scientists at the U.S. Army Chemical Corps' Biological Warfare Laboratories, Fort Detrick, Maryland.

To reduce the potential hazards from such accidents, the Fort Detrick researchers suggested using plastic instead of glass dishes.

This was one of six recommendations made in a presentation at the annual meeting of the Society of American Bacteriologists in St. Louis during May.

Infectious aerosols, or germ clouds, created when dishes containing cultures are dropped, are a seldom recognized source of illness, the researchers stated in their outline of an investigation of one such accident. Some of the particles liberated, they said, are so small they may be carried by air currents to places quite remote from the site of the accident.

To keep accidentally created aerosols from spreading, the researchers also recommended: (1) Filtering laboratory air and not recirculating it. (2) Making respiratory protection readily available. (3) Evacuating the accident area for at least 20 minutes. (4) Decontaminating by gentle flooding with disinfectant instead of forced spraying. (5) Using ultraviolet germicidal lamps.

Manuel S. Barbeito, senior author of the manuscript, read it at the meeting. He and co-author Robert L. Alg are medical bacteriologists. The third co-author, Dr. Arnold G. Wedum, is Safety Director at Fort Detrick.

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R.O.T.C. WINNERS OF A.F.C.A. AWARDS

THIS year established a new record for A.F.C.A. awards to outstanding R.O.T.C. cadets in the senior or junior classes of selected colleges or universities, majoring in chemistry, chemical engineering, or allied sciences. The number of institutions enrolled in the program was recently increased by 19, bringing the total to 47.

Awards of the A.F.C.A. honor, symbolized by a military-type medal and accompanying scroll, were made at 42 of these institutions. Five did not make awards. In that connection, it is noted that recipients of the award must meet high qualification standards not only as R.O.T.C. cadets, but also in their academic rating in the particular science fields designated by the Association.

Following, in alphabetical order, by Service—Army Navy, and Air Force R.O.T.C.—are pictures of this year's winners. In the picture identifications herein, where the words "Not Indicated" are used, they mean that information received did not indicate whether cadet was a senior or junior at the time of receiving the award.

ARMY

HUGH CLEMENTS BENNETT
No. Carolina State University
Junior

DAVID HERBERT BERG
University of Notre Dame
Not Indicated

RICHARD ELLERY BURNETT
Bucknell University
Senior

CHARLES LOUIS BRAUN
So. Dakota Sch. Mines & Tech.
Senior

ROBERT F. CUFFEL
Iowa State College
Senior

DAVID HOWARD DeVOE
Rensselear Polytechnical Inst.
Not Indicated

KENNETH KARRIS DIXON
University of California
Senior

CARL THOMAS EGGER
State University of Iowa
Senior

ROBERT WENDELL HALL
Rose Polytechnic Institute
Senior

RONALD DAVID HARRIS
The Ohio State University
Not Indicated

O. FRED HEIDER
Carnegie Inst. of Technology
Senior

ARTHUR HEIDRICH, JR.
University of Detroit
Senior

GLENN WILFRED HOFFMAN
Mo. Sch. of Mines & Metallurgy
Senior

STEPHEN A. MASTROPIETRO
St. Peter's College
Not Indicated

EDWIN FRANCIS MEYER
De Paul University
Not Indicated

ALLAN R. McMILLAN, JR.
Michigan State University
Senior

RICHARD ERIC OLSON
Knox College
Senior

ROBERT B. OTTO
Mich. Col. of Mining & Tech.
Senior

RONALD J. PUGMIRE
Idaho State College
Senior

GARY LYNN ROUBOS
University of Colorado
Senior

PERRY J. SCHWIERZKE, JR.
A&M College of Texas
Senior

ROBERT F. SIEVING
Ohio University
Senior

JOHN SOOY
University of Delaware
Not Indicated

HORACE D. STEADMAN, JR.
Wake Forest College
Senior

ROBERT ROY SWANK, JR.
Georgia Inst. of Technology
Senior

THOMAS JOSEPH SWENSON
Marquette University
Senior

NAVY

WILLIAM D. BERBERICH
Columbia University
Senior

BARRY ROBERT BRONFIN
Massachusetts Inst. of Tech.
Junior

LARRY EUGENE FAITH
Purdue University
Not Indicated

JOHN B. MABRY, JR.
Vanderbilt University
Senior

ALAN IVINS McCONE
University of Wisconsin
Senior

GEORGE COLBY PORTER
University of Nebraska
Junior

CHARLES W. J. SCAIFE
Cornell University
Senior

HARRY DADY SIMMONS, JR.
University of Illinois
Senior

LLOYD DIXON VAN HORN
Rice Institute
Senior

AIR FORCE

CALVARD SCOTT ALLEN
Brigham Young University
Junior

JOHN F. ALTENBURG
No. Dakota Agricultural Col.
Junior

KENNETH J. DAVIS
University of Oklahoma
Senior

WILLIAM PHILLIP JOHNSON
University of Cincinnati
Junior

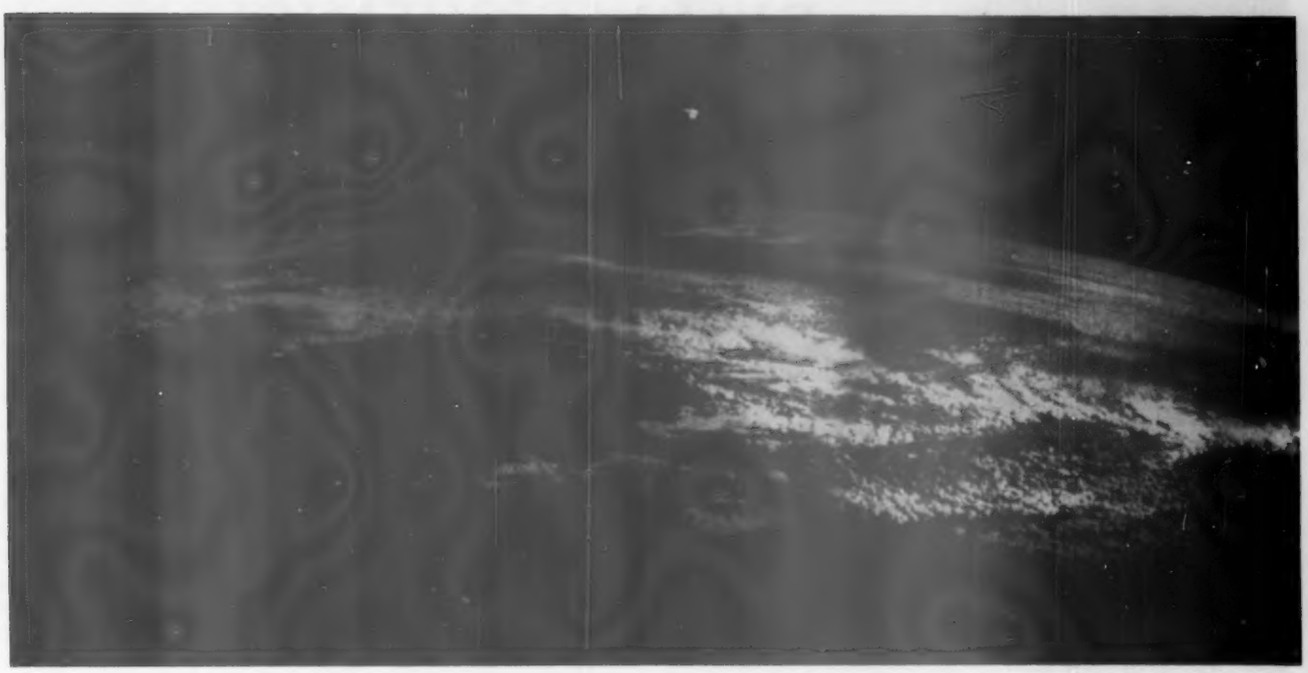
PICTURE NOT
RECEIVED BY
PRESS TIME

ARTHUR ROSENTHAL
California Inst. of Technology
Not Indicated

RONALD LEO SCHLEIF
South Dakota State College
Not Indicated

GARLAND G. WATSON
Mississippi State University
Not Indicated

LOOKING DOWN A 1000 MILE STRIP OF THE WORLD



Official U.S. Navy Photo

ONE of the projects in the U. S. Navy's current space research program is the development of improved weather forecasting through high altitude observations. The illustration herewith is a mosaic from a film made by a special camera carried in the nose cone of a rocket which was fired on December 5, 1958 to an altitude of 86.25 miles.

The picture shows the cloud formations over an Atlantic Ocean area, starting about 200 miles offshore and stretching about 700 miles further seaward. The strip, covering approximately 1,000 miles in length, compares roughly with the expanse between the southern tip of Maine and mid-Florida. The launch was made from the National Aeronautics and Space Agency's Pilotless Aircraft Research Station at Wallops Island, Virginia.

The project, known as HUGO, is carried out by the Office of Naval Research with funding assistance from the Bureau of Aeronautics and the U.S. Weather Bureau.

The design and construction of the HUGO rocket/camera assembly was done by the New Mexico State University at Las Cruces, New Mexico, under the office of Naval Research. The cameras themselves were specially designed and prepared by the Naval Research Laboratory.

It is stated that this was the first time that man has been able to look down from so high a vantage point on physical manifestations of the Norwegian weather front theory by which meteorologists have been forecasting the weather for the past 40 years.

The name Project HUGO is the short title composed of the first letters of the descriptive phrase for such flights, namely; "Highly Unusual Geophysical Operations."

SIX VOLUMES OF ARMY RESEARCH TASK SUMMARY MADE AVAILABLE

A series of reports on all unclassified projects of the Department of the Army, making up six separate volumes, are available to the general public through purchase from the Office of Technical Services, Department of Commerce. These volumes appear under the title of *Annual Research Task Summary, 1959 Edition.* While there have been numerous separate releases covering some of the Army research program, which have appeared in scientific and technical publications, this is the first time the entire unclassified account of this work has been published and put on sale. A single page is devoted to each task, which contains a brief description of the work being done or planned to be done, together with the purpose, scope, approach, and status of each as of September 1958. Individual principal investigators are listed, together with identification of agencies or contractors. No fiscal information is included. The six volumes are divided as follows:

Vol. 1. Biological, Medical, Social and Behavioral Sciences, and Operations Research
Vol. 2. Chemistry
Vol. 3. Physics (Part 1).
Vol. 4. Physics (Part 2), and Mathematics
Vol. 5. Geophysical Sciences and Engineering
Vol. 6. Materials Technologies

Volume 5 contains a limited amount of chemical engineering, and Volume 6 is also of interest to the chemical and metallurgical professions.

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DEFENSE CHEMISTRY IN THE NEWS

By WILLIAM T. READ, SR.

BASIC RESEARCH

The synthesis of optically active organosilicon compounds and their inversion are expected to be as significant for silicon as such stereochemistry has been for carbon. Pure optical isomers of alpha-naphthyl-phenylmethyl silane have been separated by fractional crystallization of diastereoisomeric alkoxysilanes and their reduction by lithium hydride. The dextrorotary isomer is converted to the levorotary form by chlorination and reduction with the metallic hydride. The same optical structure is retained when a deuterosilane with a dextrorotation is reduced by lithium aluminum hydride. Other optically active organosilicon compounds have been made containing bromine, hydroxyl, and a methoxy group as substituents.

In connection with studies of combustion processes in rocket motors which involve reactions too fast for kinetic studies but too slow for shock tube tests, these can now be investigated by means of a new flow reactor recently developed for the Air Force. The reactor deals with systems within the reaction time range of 1 to 100 milliseconds. The first material to be studied was ethylene oxide, the kinetics of its decomposition being investigated up to the adiabatic decomposition temperature. The reaction zone can be extended over any desired length, with elimination of undesirable factors and electrical control of the temperature of the reactant section.

ANALYTICAL METHODS

A rapid method for the determination of chlorine in organic compounds, now being largely employed in the analysis of pesticides, but to some extent in polymer analysis, and apparently applicable in other fields, has recently been announced. It consists in weighing a small sample into a beaker, adding excess of ammonia together with some diethyl ether. Reduction to chloride ion is accomplished by a small amount of metallic sodium, a blue color indicating completion of reduction. Moisture of the air converts excess sodium to sodium hydroxide. Any sulfur present must be converted to sulfate by hydrogen peroxide and heating. After neutralization, the chloride is determined by titration with silver nitrate.

Gas chromatography has until recently been confined to analysis, but a chromatograph is now capable not only of fractionation, but also of collecting the fractions in relatively large amounts for further study. These volumes are of the order of 100 times those separated by analytical chromatographs. The materials so collected are of a high degree of purity, foreign materials being present in amounts less than 1 p.p.m. Long parallel columns are employed with independent temperature controls. Thus columns and detectors may be operated at different temperatures. Carrier gas may be recycled for reuse, traps removing-foreign materials that are not collected.

Two recent advances in the field of spectrometry combine speed and versatility. By employing a cyanogen-oxygen flame, temperatures of 4,800°K can be attained, and as many as 17 elements can be determined, while only two could be detected by conventional flames. The quantity of sample required is very small and the time for simultaneous determination of several metals is a matter of seconds. By using a spectrometer equipped with photomultiplier tubes and a grating spectrograph, the capacity of the instrument is greatly increased as the high temperature insures the energy for excitation of heavier elements. The second method depends on a gamma ray spectrometer for nondestructive analysis of solids with large samples. So far it has been applied only to nitrogen in foods, fertilizers, and explosives, but the technique can probably be expanded into the construction of other instruments for estimation of chlorine, phosphorus, chromium, iron, and other elements. The sample is charged into a water-jacketed hopper holding around 0.5 cubic foot. Fast neutrons pass through the sample and part of them are counted as they pass through the equipment without change into a monitoring device, which includes a linear amplifier and register. Other fast neutrons are converted to thermal neutrons by the hydrogen in the sample and water of the shield, and these are captured by elements in the sample which emit gamma rays. The nitrogen spectrum is due to capture of a thermal neutron by the nitrogen-14, which becomes nitrogen-15. This in turn decays to a lower energy state and emits a gamma ray of 10.8 m.e.v. By comparing the readings of the two counters, the amount of nitrogen may be calculated, scanning being confined to the nitrogen spectrum.

METALS

Titanium resists corrosion only under oxidizing conditions, but the alloying of this metal with as little as 0.1% of palladium extends corrosion resistance well into the field occupied now primarily by tantalum. Other noble metals have the same effect, but palladium is the least expensive of these, and increases the cost to the extent of only 28c per pound. An electrochemical theory has been advanced to explain this effect, which is based on formation of galvanic couples on the surface whose sites have low hydrogen overvoltage. Palladium powder is mixed with powdered titanium, followed by compression, and melting by electric heat.

A new corrosion inhibitor has been recently announced which has the unique property of rapid drying out of an

electric motor that has been watersoaked. The material will also remove rust and contaminants from metals and other surfaces, and at the same time give them moisture and corrosion resistance. The corrosion inhibitor has been given shipboard tests to prove its effectiveness in corrosive salt atmospheres. It has also been used as a base coat under paint, as a coating for ducts, carrying corrosive fumes, and on plastic control boards that become conductors when wet with salt water. The coating is very thin so as not to interfere with working of precision parts, is compatible with lubricants, and may even have some lubricating action itself. It is made up of an organometallic compound, a wetting agent, and a solvent, any of which may be changed to meet requirements. Salt crystals developed in multimetal systems are removed by release of surface tension. The film must be replaced periodically, the time depending on requirements, varying from a week to a year.

The floating zone method for producing very pure elements has heretofore been limited to small rods, since larger ones cannot be melted through before a height is reached at which surface tension ceases to support the molten metal. By using thin-walled tubes and metal sheets the process can be applied to materials of greater volume, and also to a number of other elements besides silicon, germanium and iron. Another technique is the confining of the molten zone within the unmelted corners of a bar, which functions as crucible or cage. This method is applied to metals that are too reactive to be melted in an ordinary crucible.

Zone refining melting is now being applied to a great variety of crystalline materials, among which the following have been reported: organic reagents of high purity; scintillator crystals; water removal from dioxane; polymer fractionation; crystallization from solvents; liquid compounds cooled to freezing point; low-melting waxes; and desalting sea water. The process appears applicable in large quantities in the purification of commercial chemicals.

ELECTRONIC MATERIALS

A recent review of electrical power rectifiers points out that both the mechanical and mercury types are facing stiff competition from semiconductor rectifiers. Of particular interest to chemists are the two elements on which these newer devices depend, germanium and silicon. While germanium was the first material to be used in 1954, silicon is now being chosen for most semiconductor equipment being manufactured for the electrochemical industry. Silicon rectifiers are also finding uses where germanium was never employed, and a potential market appears to be opening outside their present main applications in electrochemistry. Much of this swing towards silicon is due to the production of the element in a high degree of purity, with other elements present being measured in terms of parts per billion. With proper melting and protection, silicon rectifiers are not changed after long periods of service.

Transistors may be replaced in many electronic pieces of equipment by a device, developed by the Naval Ordnance Laboratory, which depends on the movement of ions in solution. The electrical charge is carried by ions rather than by electrons as in vacuum tubes and transistors. The device, known as a "solion," requires from 1/100 to 1/1,000 the power that is needed by transistors. It is said to be highly sensitive to low-energy stimuli, and its other features include inherent stability, long life, simplicity of operation, light weight, and ease of manufacture.

PETROLEUM AND COAL PRODUCTS

Synthetic lubricants, heretofore used mainly in military jet aircraft, are being increasingly required as commercial airlines swing over to jet planes. This coincides with the military shift to aircraft of the rocket type in which such lubricants are not needed. Base materials for such jet lubricants are mainly diesters and complex esters of dibasic acids, together with higher aliphatic alcohols and diols. A polyphenyl ether is being tested in thermally stable lubricants, hydraulic fluids, and greases. Such ethers represent lubricants that can be used in engines of both the turbojet and nuclear type that are not as yet developed. The useful temperature range of these ethers is said to be from 200°F to 400°F beyond present synthetics, and they are as much as two to five times as stable towards nuclear radiation. A recent development in the field of greases operating in the range between —65°F and 400°F is the use of an aryl-substituted urea as a thickener in a non-petroleum fluid.

Molecular sieves, made up of crystalline aluminosilicates with a high percentage of pores of molecular dimensions, are being used to remove normal or straight chain paraffins from the higher-octane branching and cyclic hydrocarbons of a gasoline. This eliminates the necessity of adding aromatics to counteract the effects of these paraffins on antiknock performance. Paraffins are selectively adsorbed, and are later recovered and used as feed in isomerization units. Hydrocarbons containing seven carbon atoms or more can be removed in this way from catalytic reformates, the improved product being further treated with additives to increase octane ratings. The most promising of such additives is announced as being tertiary butyl acetate.

Several companies propose increases of capacity of the oxo process for making higher alcohols from petroleum hydrocarbons, so that the total capacity will be about double the present production figures. The major products of this process are butyl, amyl, tridecyl, decyl, and isooctyl alcohols. The largest users of some of these alcohols are the plastics industries in the manufacture of plasticizers. Solvents and intermediates account for a good part of the remainder. Oxo alcohols are competitive with other higher alcohols in the synthetic lubricant field. Some progress has been made in the introduction of the higher molecular weight materials in detergent manufacture. Oil companies market all of their products, while chemical companies in this field use a part of what they make in their own plants in the manufacture of other chemicals.

Low-temperature carbonization of lignite, of which there are abundant supplies in the United States, forms a primary tar which gives promise of yielding a number of valuable products. Those immediately suggested are rubber chemicals, wood preservatives, and pitch. The neutral oil from the tar, divided into two fractions of low and high boiling ranges, is made up of around 36% olefins, 30% aromatics, 20% polar compounds containing oxygen, nitrogen, and sulfur, and 14% aromatics. The olefins are mainly of the alpha type with long chains. Neutral oil represents around 70% of the distillates, the reminder being largely tar acids, with a limited amount of tar bases. Hexane and aqueous methanol may also be used with the tar as extractives, the former taking out the neutral oils and the alcohol the tar acids, with tar bases being divided between the two solvents.

Rapid building of asphalt-coated roads in which emulsions are employed is now possible by substituting a catonic emulsifier based on fatty acids for the usual

anionic emulsifying agents. The latter act very slowly, sometimes requiring two or three days; rain and cold weather interfere with their action; and not all types of stone may be used as a base. Since most surfaces carry a negative charge, the cationic emulsifiers may be employed with more types of aggregates, and also the emulsion adheres to wet stone. Hard water may be used instead of softened or demineralized water. The emulsifiers of the new type are based on tallow, and are either diamines or ethyoxylated diamines.

SYNTHETIC PLASTICS AND RUBBERS

A painting technique, developed abroad some years ago but only recently made available to users in the United States, is based on fluidized pigmented resin powder with air at ordinary temperature as the carrier gas, into which heated metal objects are placed. This permits coating of irregular surfaces which are hard to paint by ordinary techniques. Epoxy resins were the first to be used, but the process is practicable with a number of other types of plastics. The process does away with solvent losses, and thicknesses may be attained up to as much as 20 coats of ordinary coating materials. Attachment to metal is so complete that the coating does not break away from flexed springs.

Foam-forming plastics have been made the source of a variety of smokes with special properties. By regulating the size of particles in such smokes, the rate of fall-out can be controlled. Low-density smokes remain in the air longer than those now commonly in use. While several types of plastics can probably be used, the most promising are polyether-based urethanes, polyester-based urethanes, and phenol-formaldehyde resins. The plastic is melted and droplets are injected into a hot gas stream, which might be produced by gas turbines, internal combustion engines, and jet, turbojet, and rocket engines. Uses suggested by the inventor include the following: tracers for rockets and satellites (employing metallized smoke particles); smoke screens; shielding against thermal radiation from nuclear attacks; seeding of rain clouds; protecting orchards against low temperatures; preventing evaporation losses from reservoirs; and petroleum storage tanks; carriers for insecticides; and decontamination of polluted air.

A plastic containing barium ferrite and made up of plasticized polyvinyl chloride is said to have greater magnetic attraction than many rigid magnets. It may be spot- or shape-magnetized, and the first use to which it has been put is in seals for cabinet doors. Its flexible character suggests many other uses.

A very promising development in the field of flame-resistant polymers is in the production of a highly chlorinated monomer, 3,3,3-trichloropropene-1. This material is made by addition without aid of a catalyst, of bromotrichloromethane to ethylene. Hydrogen bromide is removed from the addition product by sodium methoxide to give the chlorinated propene. Benzoyl peroxide is the catalyst that brings about copolymerization of the trichloropropene with ethylene and vinyl acetate to make polymers that have a high degree of flame resistance. Some polymers of the monomer alone have been made, some of which have high melting points and will not support combustion. This work is still in the laboratory stage, but is being watched with great interest by those in the polymer field.

Ultraviolet instability of polyethylene and polypropylene plastics is now being largely overcome by inclusion of an ultraviodet absorber, which is entitled 2,2'-dihydroxy-2-n-octoxybenzophenone. Carbon black is effective in this respect, but only opaque black plastics are made with it. Tests in desert sunshine with the stabilized material showed 85% retention of original elongation after two months exposure, as compared with only 9% retention with unstablized fabrics. Marine ropes, tarpaulins, high-altitude balloons, all types of thin sheeting, and coated fabrics will probably be the principal users of the shielded material.

Urethane foams are being substituted for air in tubeless tires with very satisfactory results. In addition to comfortable riding qualities and good performance on high-speed turns, immunity to flats and blowouts is conferred on tires so filled. In fact, tires have been purposely damaged by rifle shots, drilling of holes, and cutting out wedges with a saw, and have remained in one piece on driving tests. The foam employed has a density of 35 pounds per cubic foot, and softens above 300°F. Liquid material is introduced through a hole through the tire rim on the inside, and the foam so produced appears to bond to the casing and the metal rim. In comparison of foam-filled tires and those inflated with air, on the same car, and driven in hot weather, no difference in heat build-up was observed. A great amount of road testing is still to be done before the new type of tires will be on the market.

Molecular sieves, of the type referred to earlier, are also being loaded with curing agents and catalysts that are too active for the rubber and plastics industries. By introducing this material into the mix, the curing agents are strongly adsorbed and held so that they do not affect the rubber or resin formulation during processing and storage. At the high temperature of vulcanization or curing, they are released to perform their proper function. Also quite volatile materials may be held in these molecular sieves without danger of loss. Secondary accelerators which serve to activate the primary catalyst are also held by such sieves, these being quite active and volatile unless adsorbed on the sieve pores. The aluminosilicate material of the sieves is relatively inert and present in small volume, and has no adverse effect on the products.

TEXTILES AND FIBERS

Partially carboxymethylated cellulose which has been subjected to oxidation is a material which lends itself to a number of chemical reactions that are not possible with ordinary cotton cellulose. This treated cotton dissolves readily in alkaline solutions, and thus may be used in the manufacture of lace that is sewn on cloth that is made from it. It can also be made into surgical gauze possessing considerable strength that will dissolve when left in the body. Cotton similarly oxidized and made into gauze has very little strength. Oxidation with nitrogen dioxide results in a material that can be dissolved by body fluids which are weakly alkaline. Mercerized cotton can not be so oxidized to a similar solubility. Phenylmercuric acetate or mercuric chloride produce, with partially carboxymethylated cotton fibers, a material which is self-sterilizing, a 1% mercury content destroying some organisms and preventing the growth of others. The material, however, could not be used for human clothing because of its toxicity. Other treatments of this type of cotton are being studied with a view of producing wrinkle-resistant or flame-resistant fabrics.

Treatment by a water-soluble acid colloid of methylolmelamine is the basis of a practical method for producing cotton fabric with outstanding rot resistance and improved weather resistance. This work has recently been

announced by the Agricultural Research Service of the U.S. Department of Agriculture. The resin penetrates the outer portion of the fiber cell wall, and thus becomes a part of the fiber itself, rather than exterior coating. Compared with untreated cotton, which was in shreds after a week in soils containing fabric-destroying bacteria, the treated cloth retained 100% of its breaking strength after 21 weeks of soil burial. This chemical treatment may be used in conjunction with coloring pigments to increase resistance to deterioration by sunshine, and may also be applied directly to many vat-dyed fabrics.

A two-way stretch, waterproof fabric has been developed by the Navy which is particularly suited to swim or rescue suits in cold-water areas. The fabric is three-layer laminated, and is considered to be superior in every way to the one-way stretch and calender-coated materials now in use, being lighter, stronger, and more flexible. It also has better stretch properties, lower modulus in length and width, together with good heat resistance and retention of properties after frequent water immersion and laundering.

FOODS

Detection and evaluation of flavors have long depended on the human nose, and usually require collaboration of a team engaged in organoleptic testing. Gas chromatography has entered the field, and recent investigations, both in a university laboratory and by the Army Quartermaster Corps, have identified a number of components of coffee aroma. A further advance in this field is the addition of ionization detectors to chromatographic columns. A few cubic centimeters of air are taken from the immediate vicinity of the material giving off odor, and the components are selectively separated in the column and then passed on to the ionization detector, which indicates the presence of each. The sensitivity of the equipment is said to be of the order of 10^{-14} to 10^{-12} mole. It is even possible by variation of voltage conditions of the ionization detector to discriminate between different members of a homologous series. The great rapidity of the method eliminates the possibility of chemical changes which accompany older methods of concentration of larger quantities in order to get a sample detectable by such procedures. The immediate application appears to be in connection with food flavors, but may become a valuable research tool and a method of quality control in many fields.

Polymerization of a mixture of amino acids, in which two acids, aspartic and glutamic are present in excess, has resulted in the production of something like 50 materials which resemble natural proteins very closely. They are now termed protenoids. Polymerization is brought about by heating the acids together to temperatures ranging from 150°C to 190°C, and addition of small amounts of phosphoric acid is said to increase yields from a maximum of 30% obtained by ordinary heating. The final products contain all of the original amino acids in peptide linkages, and molecular weights range from 3,000 to 9,000. They are not, however, exact duplicates of natural proteins produced by higher organisms, and appear to have an imide linkage which would differentiate them. Possibilities of practical application include adding these materials to foods to increase content of essential amino acids, and making films and fibers from them of the same type as those now made from natural proteins.

Crystallization is a major drawback in the use of honey as a food. Heating will prevent crystallization, but at the expense of darkening the product and destroying enzymes, vitamins, and aroma. Carob syrup, which contains mainly sucrose, is not a satisfactory source of this sugar because it cannot be readily crystallized from this syrup. Low molecular weight fatty acids proved to be the inhibitors of crystallization in this case. Isobutyric acid and sorbic acid have successfully prevented honey crystallization, the latter being preferred because it is odorless. Isobutyric acid fed to bees in levulose solution resulted in their producing a honey that contained no crystals, even on long storage. Some work has been done on the use of ultrasonic waves for the same purpose, but with incomplete but promising results.

CHEMICAL ENGINEERING

Chlorine is commonly stored as a liquid at atmospheric temperatures but under heavy pressure in vessels rarely exceeding 150 tons capacity. Large quantities of liquid chlorine are now being stored at atmospheric pressure but at —30°F. As much as 2,000 tons, or more than 300,000 gallons, of liquid chlorine are now being successfully stored in a single steel, double-walled sphere. The facility has been in operation for two years with the equipment remaining in perfect condition and with no evidence of corrosion. The sphere is around 45 feet in diameter, the inner shell being a little less than one inch in thickness. The outer shell is lined with foam glass for one third of the way up from the bottom, and the inner shell is supported on this with a quartz fiber insulation. The remaining space between the two shells is filled with loose volcanic ash, through which dry air circulates. The chlorine evaporates at rates of 2.5 to 4 tons per day, the chlorine gas being removed and reconverted to a liquid for return to storage. In the event of a rupture in the system, the liquid chlorine will evaporate very slowly rather than flashing off. Liquid chlorine is fed into a freon jacketed cooler and is chilled from 8°F to —30°F. As needed the liquid is removed by submerged centrifugal pumps and warmed to —10°F to be fed into scale tanks and tank cars.

The program of producing fresh water from brackish water supplies and from sea water continues to expand. In addition to extensive research, the Office of Saline Water of the U.S. Department of Interior is supporting demonstration plants. Considerable attention is being given to the possibilities of utilizing atomic energy in this field by linking a nuclear reactor to a flash distillation system. Other distillation processes that are being tested include rotary vapor-compression distillation and a multistage flash system, the latter being favored by private manufacturers and engineering firms. In the field of solar distillation, there are two types under test, one using a glass-covered deep basin and another plastic-covered stills. Membrane processes include one based on electrodialysis, which employs direct electricity to drive the salt through ion-selective membranes, while another is known as an osmionisis process, in which ionic charges are employed. A process using freezing methods, another solvent extraction, and a third biological absorption of salt, are also being worked on.

Graphite fibers and fabrics are now being produced for use in reinforcing plastics for high-temperature operations, for making bag-type filters for use with hot gases that are not oxidizing, for equipment that is exposed to corrosive fluids, and for thermal or acoustical insulation that is exposed to high temperature. Cotton or rayon is first carbonized in the form of fabric, yarn, felt, or batting, and conversion to graphite is accomplished by electric heat in the range of 5,400°F.

A new piece of equipment which is essentially a mobile robot, and is known as the Mobot, now makes possible

the enlargement, practically without size limitation, of areas in which it is dangerous for man to enter. This is particularly true where radioactive materials are involved. The machine not only possesses hands like other remote manipulators, but is on wheels and can be moved by outside direction. It also has ears in the form of microphones, and eyes as TV cameras. It is connected by a single cable to an outside control console.

COL. McKINNEY HONORED FOR PROTEIN TOXICITY STUDIES

Leonard L. McKinney, research chemist and Assistant Director of the Department of Agriculture's Northern Regional Research Laboratory, Peoria, Illinois, a Lieutenant-Colonel in the U.S. Army Chemical Corps Reserve, and a member of A.F.C.A., was presented the Department's Superior Service Award by Secretary of Agriculture Benson in ceremonies which were held in Washington, D.C., on May 26.

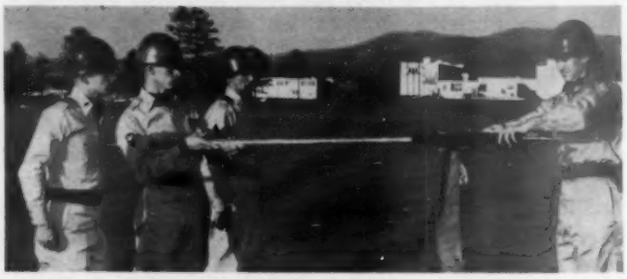
Colonel McKinney was honored for important achievements in toxicity studies pertaining to soybean oil meal processed through the use of trichloroethylene as a solvent, which work may provide a lead for developing new anti-cancer drugs. Specifically, Colonel McKinney identified and synthesized a cysteine derivative (DCVC) as the toxic factor encountered in trichloroethylene-extracted soybean meal (TESOM)—used as cattle feed.

As a result of his work, the Department states that the use of trichloroethylene in processing soybean meal, which resulted in high death rates among cattle has been discontinued in this country.

A.F.C.A. PLAQUE TO CAPTAIN BASS

Captain Sam Bass, Chesapeake Chapter, Armed Forces Chemical Association, receives the Chapter Plaque from President S. Yeardley Smith. The Plaque was presented to Captain Bass for his efforts in enrolling ten new members. Picture was taken at Chapter meeting last March prior to recent chapter elections.

DEACTIVATION CEREMONY FOR THE 74TH CHEMICAL COMPANY



74th CHEMICAL COMPANY DEACTIVATED—Lt. Colonel Elvin Dalton, (R), commanding officer 218th Chemical Battalion, casing the 74th Chemical Company's guidon, April 24, during a ceremony at Bullene Field, Ft. McClellan, Ala. (L-R), 1st Lt. William Staples, 74th Chemical Company commander; Sp4 James Bronson, and MSGT Otis Hall, 74th first sergeant, assist in the proceedings marking the official deactivation of the unit which served in World War II campaigns.

ARMY DESIGNS SHELTER TO PROTECT AGAINST A-WEAPONS

An underground shelter designed for protection against atomic weapons effects has been tested with conventional explosives under high explosive blast conditions.

Developed by the U.S. Army Engineers, the structure is designed for use in overseas theaters of operations. The shelter is formed of heavy corrugated steel plates bolted together in the shape of a parabolic arch. Sixty-eight feet long, 10 feet wide, and having a crown height of seven feet, the test unit was placed in an excavation 11 feet deep, and covered with four feet of soil. Entrance is through two combined vertical and horizontal tubes, each three feet in diameter and 30 feet in overall length capped with a perforated blast cover and door. At ground surface, rocks are placed around the tubes to a depth of five feet to form a blast arrestor. The blast arrestor is patterned after a Swedish design.

The air supply is drawn through the perforated blast cover and rock bed into the entrance tubes through a number of small holes in the sides of the tubes. Hand-operated blowers are used to draw in fresh air and expel vitiated air.

Tests of a prototype at the Army Engineer Desert Test Station, Yuma, Arizona, indicated that the new shelter can withstand blast pressures up to 60 pounds per square inch (psi). An exterior pressure loading of 30 psi was reduced to four-and-a-half psi inside the shelter.

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Diammine
oxime,
Palladium
Aldehyde, Palmitoleic Acid, Palmitoyl Chlori
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Fisher Library in the Chemical Corps School dedicated to the memory of the late Colonel George J. B. Fisher. Admiring a photograph of Colonel Fisher and the memorial plaque are (L-R) Col. John M. Palmer, Commanding Officer, Chemical Corps Training Command; Mrs. Virginia Valine, librarian, and Col. Carl V. Burke, School Commandant. The flowers and books in the center were sent by Colonel Fisher's widow, Mrs. George J. B. Fisher of Ft. Meyers, Florida.

SCHOOL LIBRARY NAMED FOR COL. FISHER

FORT McCLELLAN, ALA.—The U.S. Army Chemical Corps School's Fisher Library was officially dedicated to the memory of the late Colonel George J. B. Fisher in impressive ceremonies held at the School on February 5, last.

Col. John M. Palmer, Commanding Officer of the Chemical Corps Training Command, stated the naming of the library in honor of Colonel Fisher was part of a recent program established by the Training Command to perpetuate the memory of outstanding members of the Chemical Corps.

Col. Carl V. Burke, Commandant of the School, praised Colonel Fisher's untiring loyalty, devotion, and service to the School and read the inscription on a commemorative plaque which, with a photograph of Colonel Fisher, have been placed in the Library as a tribute to him.

Several of the personal volumes of Colonel Fisher, an author and lover of books, were recently donated to the Library by his widow, Mrs. George J. B. Fisher, of Ft. Myers, Florida, who was unable to attend the dedication.

Colonel Fisher first served in the Field Artillery on the Mexican Border in 1916 as a member of the New Jersey National Guard. He was commissioned in the National Army in 1917, and in the Regular Army in 1920; served in the Coast Artillery Corps 1920-29, and in 1929 transferred to the Chemical Warfare Service, now the Chemical Corps.

Long associated with the Chemical Corps School in various executive capacities, Colonel Fisher was responsible for much of the School's wartime expansion and development. His wartime service also included overseas duty as Chemical Officer of the Third U. S. Army. His decorations include the Legion of Merit and the Army Commendation Ribbon.

Colonel Fisher retired from active service in April 1947, and died at Ft. Myers, Florida on January 11, 1956.

SCATTERED RADIATION FIELD EXPERIMENT

AN EXAMPLE OF INTER-SERVICE COOPERATION

By SP4 PAUL J. LIZUNDIA

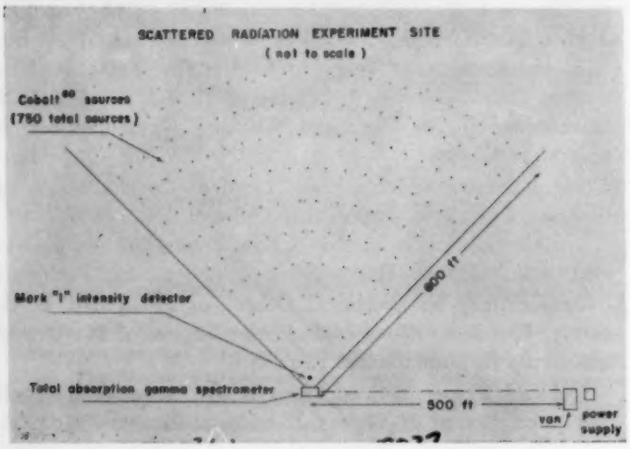
Information Specialist
U.S. Army Chemical Corps Training Command

DURING recent months a highly interesting and somewhat unique project on scattered radiation has been carried out at facilities of the U.S. Army Chemical Corps Training Command. The participants in the project were personnel of the U.S. Army Chemical Corps Training Command and U. S. Air Force Special Weapons Center, Kirtland AFB, New Mexico.

The project, organized by the USAF Special Weapons Center, was established to study the effects of scattered radiation on the design of fallout radiation shelters. Particularly because of the wide publicity[1] given to the Training Command's "radioactive real estate" located at Fort McClellan's Pelham Range, the Air Force requested permission to conduct a series of experiments at this site. Upon receiving consent from the Army to use the site, a USAF research team, headed by Captain Clayton Schlemm, was dispatched from Kirtland AFB to Fort McClellan. Other members of the Air Force group were First Lieutenant Zolin Burson and First Lieutenant Alexander Anthony, Jr.

The main radiological training area at Pelham Range is approximately three-quarters by one mile in area and contains a pattern of Cobalt^{60} point sources of 6 curies each. The sources are buried in wells throughout the area and may be raised or lowered to establish a radioactive field. At the termination of the training, the sources are lowered into the lead-capped wells to prevent accidental exposures. This procedure allows the field to be used safely for radiation tests and surveys.

The Air Force team's equipment consisted of a large trailer van, housing extensive electronic instrumentation and a heavy-duty electric power supply. The van had been used previously at the Nevada and Eniwetok test sites. Because of the critical nature of these tests, the van had been modified to contain more complex laboratory facilities and temperature control.



Detection equipment of both standard and USAF research team design included two main radiation measuring instruments. The first was a radiation energy detector (total absorption gamma spectrometer). The spectrometer, encased in a 3500 pound barrel-shaped lead "pig" utilized a sodium iodide crystal which was surrounded by lead shielding at least six inches on all sides. The device measured the energy of gamma rays which entered the crystal through an interchangeable aperture similar to the method a camera focuses light on film. The spectrometer was mounted on an ingeniously modified 20 millimeter gun turret of the type used in B-36 aircraft. Remotely controlled from the van, the turret and spectrometer were capable of rotating 360° horizontally and 90° vertically.

The second instrument, dubbed the "Mark I" by the researchers, was a standard-type gamma radiation detector mounted so it could be moved up and down a vertical plexiglas scale. Controlled from the van by a master electronic panel, the detector recorded the radiation intensity at different heights on the scale.

Before the instrumentation was emplaced, a section of the training area was constructed to resemble a fallout

[1] Major John B. Beach, "Chemical Corps School Specially Equipped for Radiological Training and Research," *Armed Forces Chemical Journal*, Sept.-Oct., 1958, pp 8-9.

ABOUT THE AUTHOR

Sp4 Paul J. Lizundia was born at Boise, Idaho, in August 1936. Following graduation from Burns, Oregon, Union High School, he attended the University of Oregon at Eugene. While attending college, he majored in Journalism and was employed by the University News Bureau as a staff correspondent. He also has writing experience with two Oregon newspapers, the Burns *Times-Herald* and Eugene *Register-Guard*. Sp4 Lizundia, who entered the Army in August 1957, has been assigned since February 1958 as an information specialist with the U.S. Army Chemical Corps Training Command, Fort McClellan, Alabama.

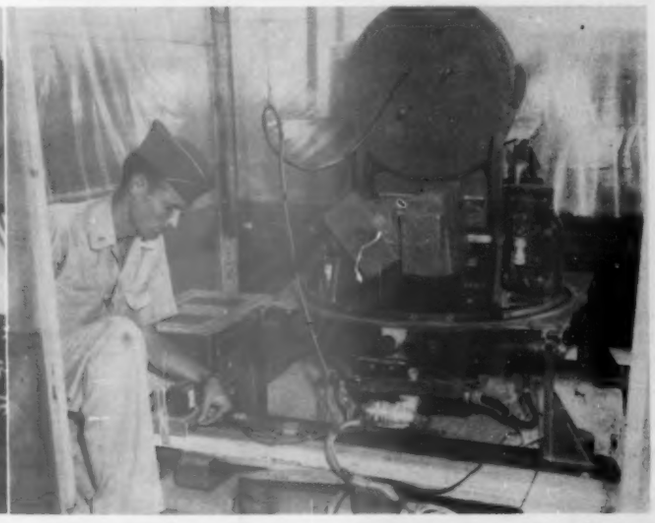
Using an Army truck-mounted crane, a joint Army-Air Force team emplaced the 3500 pound "pig" and modified B-36 gun turret. The interchangeable aperture for the sodium iodide crystal can be seen at the front of the "pig."

tion intensity of the Cobalt^{60} at different angles could be recorded. Additional information about the gamma ray energy was relayed from the iodide crystal to an amplifier which strengthened the initial gamma energy pulse. The pulse then passed through an analyser enabling the pulse image to be seen on an oscilloscope screen. By attaching a small camera to a hood of the oscilliscope, photographs were taken of the pulse energy and intensity.

Scattered radiation coming in at all angles and with varying intensities and energy is difficult to predict. Lack of accurate information in this area has limited shelter design information. The practical field experiment performed by the Air Force Special Weapons Center with the help of the U.S. Army Chemical Corps Training Command will assist in the designing of effective personnel and equipment shelters.

The experiment is also an excellent example of interservice cooperation that is necessary to strengthen our defensive capabilities against future aggression.

The researchers carefully connected and tested the complex wiring and electronic controlling systems after the spectrometer and turret were emplaced. The turret drive mechanism and servo systems can be seen in this back view of the spectrometer.



A comprehensive gamma ray photographic data booklet was compiled during the experiment. The intensity and energy photographs were made with a small camera attached to the hood of the oscilloscope screen located on the analyzer.

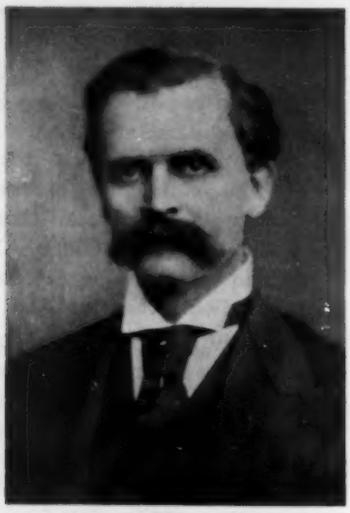
pattern. The experiment site development included clearing and grading a quadrant of land with a 600 foot radius (see chart). Following ground preparations, 750 wooden stakes were placed at prescribed intervals in ten rows of concentric arcs. The van and power supply were positioned at a point 500 feet from the quadrant focal point. Both the Mark I standard detector and the turret-mounted spectrometer were located at the focal point. Members of three Chemical Corps Training Command organizations—the First Radiological Safety Support Unit, Chemical Corps School Support Battalion, and the 100th Chemical Group placed the 750 Cobalt^{60} sources on the wooden stakes.

For approximately two weeks scattered radiation was measured at the experiment site. By lowering the Mark I detector from a height three feet above ground to a point approximately two feet below ground, the radia-

Changeable weather conditions, including several thunderstorms, made it necessary to periodically inspect the plastic protective covering shielding the maze of spectrometer electronic circuits.

CHAPTERS IN CHEMICAL WARFARE

VII



WILLIAM WALLACE BLACKFORD
Lieut. Colonel C.S.A.
(1831-1905)

(Photo by courtesy of James Baylor Blackford, grandson of Col. Blackford)

SUFFOCATING SMOKE AT PETERSBURG

By WYNDHAM MILES, PH.D.

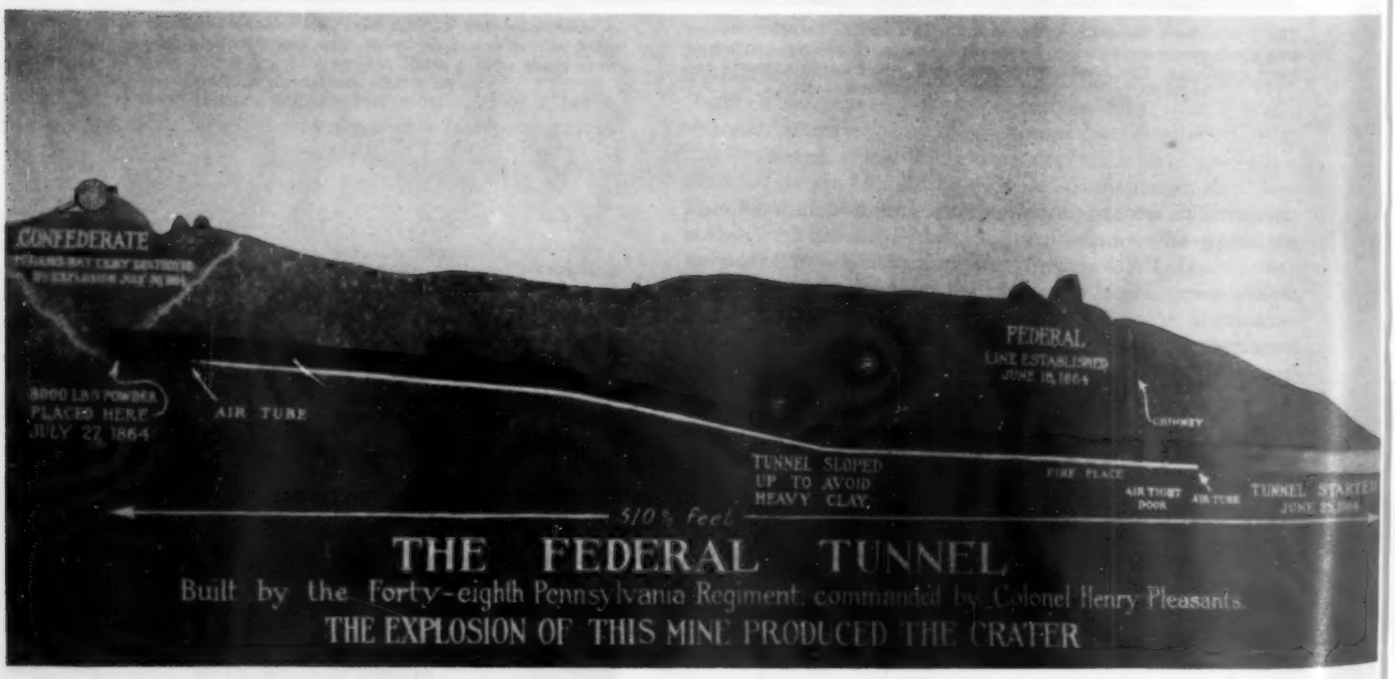
SHORTLY before daybreak on July 30, 1864, sleepy South Carolina infantry in Elliott's salient in front of Petersburg, Virginia, felt the earth erupt and hurl them into the air. When the dust and debris from the Union mine had settled, a crater 170 feet long, 60 to 80 feet wide and 30 feet deep could be seen in the Southern lines. Strewn around like toy soldiers knocked over by a child's hand lay almost 300 dead and injured Confederates.

General James F. Ledlie's 1st Division of the IX Corps, Army of the Potomac, led a Northern attack into the breach in the Confederate lines. Blue-clad soldiers streamed out of their positions, across the rough ground and into the crater. If the operation had proceeded as planned the infantry might have gone through the gap and stormed Petersburg. But the leaders blundered, the troops grew confused, and General Lee's men were able to counterattack and recapture the lost ground.

The Union mine was one of the great surprise attacks of the Civil War. More than a month of preparation preceded the underground blast. In June, men from Lt. Col. Henry Pleasant's 48th Regiment, Pennsylvania Veteran Volunteer Infantry, began to tunnel as quietly as moles toward the Confederate salient. Many of the men in the

Cross-Section View of a Scale Model of the Union Tunnel

—Photo by courtesy of Petersburg National Military Park


CONFEDERATE
8000 LBS POWDER PLACED HERE JULY 27 1864
AIR TUBE
FEDERAL
TUNNEL SLOPED UP TO AVOID HEAVY CLAY.
FIRE PLACE
AIR TIGHT DOOR
AIR TUBE
510½ Feet
THE FEDERAL TUNNEL
Built by the Forty-eighth Pennsylvania Regiment, commanded by Colonel Henry Pleasants.
THE EXPLOSION OF THIS MINE PRODUCED THE CRATER

48th were coal miners from the Pennsylvania anthracite fields, and it was from them that the idea for the operation came. They did not have an easy task digging a 500-foot tunnel under the eyes of the vigilant Southerners. The miners had to improvise their tools, dispose of a large volume of earth, shore up the tunnel as they went along, and above all work quietly. As the workings inched forward the air grew foul and the men had to find some means of ventilation. They could not open vertical shafts to the surface because the enemy would spot the holes. Finally, they devised a ventilating system that was simplicity itself. They laid a wooden pipe along the floor of the tunnel from the mouth to the forward end. Across the tunnel entrance they erected an airtight door penetrated only by the end of the pipe. Inside the tunnel entrance they built a fireplace, with the chimney going up to the surface. When they started a fire on the hearth, the hot air and smoke created a draft that sucked exhausted air from the tunnel and drew in cool, outside air through the pipe. When the tunnel was sufficiently long the miners branched to the right and left and ran a long gallery beneath the Confederate lines.

Their digging finished, the men laboriously carried four tons of gunpowder through the narrow, low tunnel, stacked it beneath the enemy, and laid a long fuse from the powder to the entrance. The mining operation was a perfect success and the Confederates were caught completely unaware. But the weeks of careful, hard work were wasted by the debacle above ground.

An overwhelming surprise like the Federal mine could happen only once in a war. After the explosion and the following battle, the Confederates took elaborate precautions to counter any further mining. At six points where the opposing lines approached most closely, Lt. Col. William W. Blackford, an engineer officer who served through most of the war with Jeb Stuart's cavalry, had his men sink shafts thirty feet deep. From the bottom of the shafts they tunneled forward until they were about ten feet beyond the parapet above, then branched left and right, giving them galleries that extended across the front of the Confederate position. At frequent intervals, in the front wall of the galleries, they bored holes four inches in diameter and extending ten to fifteen feet toward the Union lines. Sentinels paced the galleries, senses alert for any ex-coal miner who might come bearing gunpowder.

"In case the enemy struck one of these holes," wrote Colonel Blackford after the war, "the guards on duty were provided with cartridges of combustibles, the smoke from which would suffocate a man. These they were to run into the holes and fire by a fuse, closing their end of the hole tightly, and then, summoning the guard, they were to dig into and take possession of the opposing mine as rapidly as possible, giving another dose of suffocating smoke from time to time to keep the enemy out of his workings until they could dig into them." Jumpy Confederate guards, imagining the approach of Federal sappers, alarmed the camp several times, but the men of the 48th Pennsylvania had dug their last military tunnel.

I have not been able to find the composition of the Confederate suffocating smoke. Possibly it was a mixture similar to gunpowder but containing a much higher proportion of sulfur to give off sulfur dioxide as it burned. Possibly it was similar to the stink ball mixtures mentioned in early 19th century ordnance manuals, containing sulfur, rosin, pitch, asafetida, raspings from horses' hoofs, and other materials that burned with a nauseating smoke. Possibly it was an entirely novel mixture devised by John W. Mallet, the competent chief chemist of the Confederacy, or by one of his assistants.

The readying of suffocating smoke cartridges in the underground galleries at Petersburg was the closest that the North or South ever came to chemical warfare. True, Americans had considered the use of chemicals at various times. In 1862 John Doughty, of New York, had sent Secretary of War Stanton plans for a shell filled with chlorine (1). Forrest Shepherd of New Haven had suggested to President Lincoln that Northern troops advance on Petersburg behind a mist of hydrogen chloride (2). General William N. Pendleton, Chief of Artillery, Army of Northern Virginia, had considered the use of shells from which would come the "suffocating effect of certain offensive gases." (3). Other ideas regarding the employment of chemicals had passed around in conversation and print. But the preparation of suffocating smoke for countermining operations at Petersburg was the only case in the Civil War where chemical warfare seems to have gone beyond the talking or writing stage.

(1)(2)The Armed Forces Chemical Journal, March-April 1958.
(3)The Armed Forces Chemical Journal, September-October 1958.

ACC GIVES OLD AMBULANCE TO AMERICAN LEGION POST

Colonel Eugene G. Bennett (left), Army Chemical Center deputy post commander, turns over an outmoded Army ambulance to Edgewood, Md., American Legion commander Major John Puskar.

EDGEWOOD, MD.—Authorities at the Army Chemical Center here gave away a government ambulance recently but this action is not to be taken as an indication that any sure-fire methods have been found to assure against sickness or accident.

When one of the older model government ambulances recently attained the age and mileage combination to place it in the category of being "uneconomically repairable" the decision was made to dispose of the vehicle by means other than actual disassembly and physical salvage of the parts.

According to government regulations, when such equipment has reached certain age and mileage maximums, no further government funds may be spent for repair and maintenance. Disposal action then becomes necessary.

Learning of this, Major John Puskar (ret) commander of the Edgewood American Legion Post, made written application to the post commander that the ambulance be donated to the local Legion post.

In due course of time, the request was approved and in a ceremony here recently Major Puskar received keys, official title and the best wishes of the Army Chemical Center when Colonel Eugene G. Bennett, deputy post commander, made the transfer legal.

The local Legion post now has two ambulances with which to respond to community emergencies. The Chemical Center had, earlier, obtained a newer model vehicle to serve the needs of this post.

WITH THE CHEMICAL CORPS

WAC DIRECTOR, COLONEL MILLIGAN, VISITS OFFICE OF GEN. STUBBS

Colonel Mary L. Milligan, Director of the Women's Army Corps, inspects a model flamethrower shown to her by Major General Marshall Stubbs, Army Chief Chemical Officer, on a recent visit to his office.

REALISTIC CHEMICAL PHASE PLAYED AS PRELUDE TO EXERCISE LOGEX 59

FORT MCCLELLAN, ALA.—Representatives of the U.S. Army Chemical Corps Training Command attending the LOGEX 59 training exercise May 10-16 at Fort Lee, Virginia, were extensively briefed on their duties at the actual exercise during an elaborate orientation called "Chemex."

Chemex, which ended April 24, was a four-day program conducted by the Chemical Corps School Logistics Division to prepare players and umpires for their jobs at LOGEX. This year's LOGEX, the eleventh in the annual series, and with more than 7000 participating, was the largest logistical exercise of its type yet conducted. Participants included personnel of the Department of State, the Navy, and the Air Force, as well as the Army.

Produced at Fort Bragg, N. C., by the 1st Logistical Command, LOGEX is a multi-purpose exercise, primarily for training advanced students of the Army's service and technical schools.

Chemex, although dealing with only Chemical activities, stressed the importance of maintaining continuous logistical support to a field army under assumed combat conditions. The "aggressors" (enemy) in Chemex were considered capable of employing atomic, biological, and chemical weapons.

The Chemex situation began with the opening day of a simulated Allied counter-attack in Europe following the halting of an aggressor drive. Hypothetical battle factors, such as aggressor raids, nuclear air strikes and counter-attacks were introduced during the Chemex play. To carry out the logistical functions, players had to make decisions which would insure the continuous supply flow in the theater of operations.

An umpire or controller group made up of U.S. Chemical Corps Training Command and School staff members made certain that the players' decisions were feasible and were in accordance with existing regulations. Acting as chief controller was Colonel Laverne A. Parks, Asst. School Commandant, while Colonel William Foley, of the Chemical Corps Materiel Command, was chief player.

Although a "paper battle," Chemex was as realistic as conditions would permit. Accurate area maps, terrain and weather data, aggressor capabilities, simulated attacks—every conceivable facet of actual tactics—were introduced. As distance is an important consideration in combat, the time and space requirements for travel had to be observed by the players. This greatly increased the realism of play.

Participating in the Chemex program were 63 officers and 36 enlisted men.

SGT. BRUCE, TOP CML. CORPS NCO

TOP OF THE LADDER—Wearing the star-studded chevrons of his new grade, Master Sergeant Robert A. Bruce is congratulated by Brig. Gen. Harold Walmsley, Army Chemical Center post commander, on becoming the highest ranking non-commissioned officer in the Chemical Corps. M/Sgt. Bruce was recently promoted to the top of the new supergrade structure, with grade E-9.

MR. LOUIS BENJAMIN

Mr. Louis Benjamin, who was chief of the Development Division, U.S. Army Chemical Corps Research & Development Command, Washington, D.C., died suddenly on May 9 while attending a NATO Conference in Paris, France. He was representing the Defense Department and the Army Chief Chemical Officer at a series of yearly talks on chemical warfare testing progress by NATO powers when stricken with a heart attack.

Mr. Benjamin is survived by his wife, Elsie, a son, Arthur B., both of Washington, and a sister, Mrs. Amelia Naftal, of New York City.

Mr. Benjamin was born in New York City, October 3, 1908, and spent his childhood in Georgetown, South Carolina. He received his Bachelor of Science Degree in Chemistry from The Citadel, Charleston, S.C., in 1930. The following year he attended Columbia University.

Prior to World War II, Mr. Benjamin was employed as a chemist in industry, and also in the Treasury Department. In 1942 he entered the Army and served as an officer of the Chemical Warfare Service, during the period 1942-1946. He became Chief of the Test Division at the Chemical and Biological Laboratories, Edgewood, Maryland, and was awarded the Army Commendation Ribbon with Metal Pendant for meritorious service. At the time of his death, he held the rank of Lieutenant Colonel in the U.S. Army Reserve.

Following his release from active military service in 1946, Mr. Benjamin remained in the Chemical Corps in a civilian capacity.

CHEMICAL CORPS TRNG. COMMAND AIDS IN EXERCISE "BIG BLAST"

Six officers assigned to the U.S. Army Chemical Corps Training Command, Fort McClellan, Alabama, (shown in picture herewith) participated in the Fifth Army tactical exercise "BIG BLAST X" at Fort Sheridan, Illinois, January 23-25. They had completed specialized training at the Chemical Corps School's Radiological Branch.

During "BIG BLAST X" the Training Command instructors operated radiological centers, a concept recently developed by the Chemical Corps.

One of the major problems involved in nuclear or atomic warfare is determining where the radioactive materials from an explosion will fall to the earth, and how this fallout will affect military operations. To assist Army and other commanders in solving the fallout problem, the Chemical Corps developed the idea of radiological centers, operated by specially trained personnel.

Left to Right: 2nd Lts. Charles T. Tucker; George R. Caruso; Roy D. Bundy; Robert B. Davis; Kenneth V. Bagnetti; and David J. Bentley.

URGE SCIENTISTS TO USE TERMS MORE UNDERSTANDABLE TO LAYMEN

ARMY CHEMICAL CENTER, MD.,—Mr. Arnold Wilkes, WBAL (radio) director of public affairs and education (left) in picture herewith, and Dr. S. D. Silver (right), of the Army's Chemical Warfare Laboratories at Edgewood, Maryland, recently made a joint appeal for improved scientist-layman understanding in this era of missiles and space exploration. Mr. Wilkes told a group of researchers that "Scientists must learn to communicate." "Your discoveries," he said, "must be taken out of your books and put in our bones. It is a national necessity to make ignorance unfashionable." Dr. Silver advised the group to leave off "scientific gobbledygook and speak the American language" in their contacts with the public. One of the Chemical Corps' top scientists, Dr. Silver has long been an advocate of keeping the public abreast with the aims of the scientific community.

EX-BIG LEAGUE PITCHER IS PINE BLUFF DINNER GUEST

Lon Warneke, former major baseball league pitcher, was guest speaker at the April "Star Night" dinner at Pine Bluff Arsenal, Arkansas, commanded by Colonel Russell W. Dodds. Mr. Warneke is now a businessman in Hot Springs, Ark. In picture above, l to r, are: Colonel Dodds, Mr. Warneke and Colonel G. S. Chittick, Chemical Corps Inspector General, at the post at the time on an official visit.

LT. COL. LINDSEY HEADS MEDICAL RESEARCH AT ACC

ARMY CHEMICAL CENTER, Md.—Lieutenant Colonel Douglas Lindsey has been named director of medical research of the Chemical Warfare Laboratories here.

A Medical Corps officer with combat experience in both World War II and Korea, Colonel Lindsey holds the Silver Star with Oak Leaf Cluster, the Bronze Star, the Purple Heart, the Master Parachute Badge and the Glider Badge. He has served as deputy director of medical research for the past year and now succeeds Col. Albert R. Driesbach, who will shortly assume command of the U.S. Army Hospital at Fort Monmouth, N.J.

Colonel Lindsey is a 1940 gradaute of Louisiana State University. He earned his M.D. at Yale in 1943 and after the wars he returned there for a masters and a doctorate, both in public health. He is also a graduate of the Army Command and General Staff College, the Air University, and served as a researcher with the Walter Reed Army Institute of Research before coming to Army Chemical Center.

During World War II, he served as battalion surgeon, and during the Korean War he was chief of operations of the Eighth Army medical section.

CHEMICAL CORPS DISPLAY FOR ARMED FORCES DAY AT SANDIA

Armed Forces Day at Sandia Base, New Mexico, was held on 9 May 1959 in order to synchronize the date with a symposium of high school science students held at the University of New Mexico. The official date for the nationwide celebration was May 16.

Sandia Base had never had a Chemical Corps display and, for the event this year, Major Charles W. Chabalko, Jr., Air Defense Center Chemical Officer, made all his equipment available to Sandia.

Approximately 40,000 people visited the base and most of them inspected the Chemical Corps equipment and watched two demonstrations of chemical grenades.

The photograph herewith shows the entrance to the tent where the evolution of the gas mask since World War I was displayed.

Lt. Col. Edward G. Halligan is the chemical officer assigned to Sandia Base.

DR. DILL HONORED BY ALMA MATER

EDGEWOOD, MD.—Dr. David B. Dill, Deputy Director of Medical Research at the Army Chemical Warfare Laboratories here, has been awarded an Honorary Doctor of Science degree by his Alma Mater, Occidental College of California.

Dr. Arthur G. Coons, Occidental President, presented the degree and cited Doctor Dill as "chemist, physiologist, researcher, professor, author, servant of his country and starred man of science."

A 1913 Occidental graduate, Doctor Dill later earned his masters and doctorate in chemistry from Stanford University.

NOTED HISTORIAN DONATES HISTORY TO CHEM. CENTER

EDGEWOOD, MD.—One of America's most eminent historians has contributed to the Army Chemical Center a collection of rare maps and documents concerning the 1st Gas Regiment of World War I.

Dr. William L. Langer, chairman of the Harvard Committee for Regional Studies, has donated a 111-page volume which he co-authored in 1919, titled "With 'E' of the First Gas," plus a number of captured German field maps and three propaganda leaflets dropped over the German-American lines in France in 1918.

Dr. Langer in 1918 was Master Engineer Junior Grade Langer of Company "E" of the First Gas Regiment.

Destined to author some of the major works of the 20th century in the field of modern diplomatic and political history, Dr. Langer wrote "With 'E' of the First Gas" in collaboration with a fellow First Gas veteran, Private Robert B. MacMullin.

Company funds remaining after the war were used to finance publication of 400 copies of the book, printed by the Holton Printing Company of Brooklyn.

Dr. Langer, who served as president of the American Historical Association in 1957-58, is the editor of the 10-volume "Rise of Modern Europe," and has authored a series entitled "The World Crisis and American Foreign Policy," in addition to numerous other works.

WAC WINS "SOLDIER OF MONTH" AWARD OVER MALE COMPETITION

WAC Specialist-4 Marilyn Artrip of the Army Chemical Center, Maryland, chose to celebrate the 17th anniversary of the Women's Army Corps (May 14, 1959) by beating out all male competition for the Post's Soldier of the Month contest. Here Specialist Artrip displays a desk clock awarded by the Post as Maryland Department, Veterans of Foreign Wars Junior Vice Commander, Irving Marders (left) holds a Certificate of Merit, awarded the "lady soldier" by the Maryland VFW. At right is Department of Maryland past commander, J. William McAvoy.

COL. DODDS HEADS DRIVE FOR RED CROSS FUNDS

The Jefferson County, Arkansas chapter of the American Red Cross has named Col. Russell W. Dodds, commanding officer of the Pine Bluff Arsenal, to head its 1959 fund-raising campaign. The goal for 1959 campaign, $27,500.

RESEARCH TRAINING AT DETRICK

The Biological Warfare Laboratories at Ft. Detrick, an installation of the U.S. Army Chemical Corps, were designated by the National Research Council of the National Academy of Sciences to provide advanced training and research experience to a selected group of promising young scientists who have earned a Doctor's degree or equivalent, and have demonstrated superior ability in research.

The program, which will provide for advanced training for one year under leading Army Chemical Corps scientists, deals with five basic fields: Aerobiology, Bacteriology, Biophysics, Immunology, and Virology.

Five positions for research associateships at Detrick have been established by the Civil Service Commission.

WIDE FIELD COVERED IN MANAGEMENT SUBCOURSE

FORT McCLELLAN, ALA.—Prior to his address on the "Logistic Officers Program," Col. Felix J. Gerace, one of the Chemical Corps School's Fourth Annual Management Subcourse speakers, met with School officials. Left to right—Capt. Francois D. Gravois, Jr., Lt. Col. Robert K. Nelson, Colonel Gerace, Col. Carl V. Burke (School Commandant), Col. Laverne A. Parks (Assistant School Commandant), and Col. James O. Quimby.

FORT McCLELLAN, ALA. — Managerial personnel from industry, education, and the Department of the Army were featured speakers at the U.S. Army Chemical Corps School's Fourth Annual Management Subcourse (two weeks) of the Thirteenth Chemical Officer Advanced Class, which was concluded March 21 at Fort McClellan, Alabama.

The Management Subcourse was first established in 1956 to familiarize Chemical Corps officers with the latest developments and techniques in the field of management.

The program included a review of the basic principles of management, human relations, communications, management development, individual development, and some management techniques. In the past the course was prepared and coordinated through contractors, but this year the Logistics Division of the Chemical Corps School made all the preparations. Lt. Col. Robert K. Nelson, Division Chief, and Lt. Col. James O. Quimby and Captain Francois D. Gravois, Division Management Branch, planned, scheduled, and provided all the speakers.

Army Chemical Corps speakers included Mr. Edgar A. Crumb, Executive Director; Colonel Claude J. Merrill, Chief, Personnel Division; Colonel Eugene G. Bennett, Deputy Commander, Army Chemical Center, Md.; and Colonel William J. Allen, Jr., Commanding Officer, Rocky Mountain Arsenal, Denver, Colorado.

Other Army speakers were: Colonel Felix J. Gerace, Chief, Career Management Branch, Office of the Deputy Chief of Staff for Logistics, Washington, D.C., and Colonel Bernard S. Waterman, Commandant, Army Logistics Management Center, Fort Lee, Va.

Representing colleges and universities were Dean George E. Manners, Georgia State College School of Business Administration, Atlanta; Dean James E. Gates, University of Georgia College of Business Administration, Athens; Dr. William Gomberg, Visiting Professor of Industrial Relations, Columbia University, New York City; Dr. Powell Niland, Professor of Management, Washington University, St. Louis, Mo.; Mr. Allen H. Keally, Head, Department of Industrial Management, University of Tennessee, Knoxville; Dr. Gerald H. Whitlock, Associate Professor of Industrial Management, University of Tennessee; and Mr. Thomas D. Scriggins, Operations Research Office, Johns Hopkins University, Baltimore, Maryland.

Speakers from industrial concerns were Dr. William M. Mebane, General Manager, Thiokol Chemical Corporation's Redstone Division, Redstone Arsenal, Huntsville, Ala.; Mr. Leland W. Perkins, Materials Controller, International Harvester Company, Chicago, Ill.; Mr. Elbert W. Burr, Manager of Personnel Development, Monsanto Chemical Company, St. Louis, Mo.; Mr. Hugh Comer, Chairman of the Board, Avondale Mills, Sylacauga, Ala.; and Mr. Wilfred L. Gorrell, Manager, General Electric's Anniston Tube Plant, Anniston, Ala.

A lecturer from the federal government scene was Mr. Ross Pollock, Chief, U.S. Civil Service Commission Career Development Program, Washington, D.C.

COMMENDATION RIBBONS AWARDED

ARMY CHEMICAL CENTER, MD. — Army Commendation Ribbons for "meritorious service" were presented in ceremonies held here recently by Army Chief Chemical Officer, Major General Marshall Stubbs to:

Colonel Fred J. Delmore, president of the Chemical Corps Board, cited for rendering invaluable service to other agencies of the military establishment and providing new concepts for planning.

Colonel Montescue T. Moree, deputy to Colonel Delmore, for efficiency, leadership, resourcefulness and unselfish attitude displayed in work between 1953 and 1958 in the Advanced Planning Division of the Board.

Major Bernard F. Allen, Board administrative officer, for work in planning, organizing and policy formulation in the conduct of several independent work programs.

CIVILIAN AWARDS

Sustained Superior Performance Awards plus cash were made during April this year to Theda R. Davis, Office of the Comptroller; and Otis L. Williams—civilian employees in the Office of the Chief Chemical Officer, Washington, D.C.

Mr. Frank Russo of 972 Bedford Avenue, Brooklyn, New York, was cited for a beneficial suggestion submitted at the United States Army Chemical Procurement District, New York. Colonel Leonard C. Miller, Commanding Officer, presented Mr. Russo a Suggestion Award Certificate and a cash award of $65.

Suggestion Awards consisting of certificate and $12.50 in cash, each for suggestions to improve operations, were presented at the New York Chemical Procurement District, by Colonel Leonard C. Miller, on 8 June, to Samuel Diamond, Sonya Pesacov, Frank J. Santangelo and Phoebe H. Schoerner.

A certificate and cash for superior performance was also presented to Paul Aaronberg.

CHEMICAL CORPS TOXIC DISPOSAL AND ESCORT UNIT EXPERTS RETRIEVE WORLD WAR I SHELLS

ARMY CHEMICAL CENTER, MD.—Six gas-filled artillery shells and four conventional shells buried on the grounds of Du Pont's Eastern Laboratory at Gibbstown, N.J., since 1918, were unearthed and removed recently (Wednesday, April 22) by Chemical Corps specialists from the Army Chemical Center in Maryland.

The United States Government originally sent the 10 shells to Du Pont's laboratory during World War I and asked the company to conduct special studies on them. Six of the shells were filled with deadly mustard gas, a toxic chemical introduced by Germany during World War I.

When the tests were completed, the shells were buried in a heavy barricade 10 feet underground in an isolated area of the laboratory grounds. Any gas that might have leaked out of the shells would have been decomposed in the damp soil.

Removal of the shells was accomplished without incident by a four-man team from the Chemical Corps Technical Escort Unit, an organization which specializes in the demolition and decontamination work.

Under the direction of Captain Donald Chesebrough, the team used hand tools and probes to locate the shells. The shells containing the still potent agent were placed in special airtight containers and returned by truck to Army Chemical Center where historic and technical data will be gathered before the ancient shells are destroyed.

Expansion plans and safety precautions for the laboratory, located near Gibbstown on the Delaware River, made removal of the dangerous relics desirable, according to a Du Pont spokesman.

The services of Technical Escort Unit, the only organization in the Department of Defense trained and equipped to remove such material, were made available by Brigadier General Harold Walmsley, Army Chemical Center commander.

When the shells were buried at the end of the war in 1918, the mustard gas was expected to break down into harmless material with the passage of time. Experience has shown, however, that some types of mustard gas are among the most stable and long-lasting chemical warfare agents ever devised.

As man in background directs power shovel operations, U.S. Army Chemical Corps soldier (right) probes for buried shells at the Du Pont Company's Eastern Laboratory near Gibbstown, N.J. Recently, the team of specialists from the Chemical Corps' Technical Escort Unit successfully removed and returned ten artillery shells buried on the site for over 40 years.

The shells were all recovered in excellent condition. "Not a leaker in the bunch," remarked team leader Chesebrough. "Before we have completed our examination," he stated, "we will have learned quite a bit about these old shells—all of it of importance to the Army Chemical Corps."

Tech Escorters make it their business to know about such things. In addition to Army duties, they are called on to perform special operations for the Navy and Air Force, as well as remove long forgotten shells which still occasionally turn up after being buried and lost for almost half a century.

LEFT: Member of U.S. Army Chemical Corps Technical Escort Unit examines a large artillery shell recovered at Du Pont's Eastern Laboratory near Gibbstown, N.J. The shells had been buried at the Gibbstown site for over forty years. RIGHT: The shells recovered at the Du Pont Company's Eastern Laboratory near Gibbstown, N.J.

GROUP AND SUSTAINING MEMBERS

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American Potash & Chemical Corporation, 300 West Sixth, St., Los Angeles 54, California
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Ferro Corporation, Cleveland, Ohio
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General Tire & Rubber Company, The, Wabash, Ind.
Goodrich, B. F., Chemical Company, Cleveland, Ohio
Handy & Harman, New York, N.Y.
Harshaw Chemical Company, The, Cleveland, Ohio
Harvey Aluminum, Torrance, Calif.
Hercules Powder Company, Wilmington, Del.
Heyden Newport Chemical Corporation, New York, N.Y.
Hooker Chemical Corporation, Niagara Falls, N.Y.
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Sun Oil Company, Philadelphia, Pa.
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United-Carr Fastener Corp., Cambridge, Mass.
Universal Match Corp., Ferguson, Mo.
United States Borax & Chemical Corp., 630 Shatto Place, Los Angeles 5, Calif.
Vitro Corporation of America, New York, N.Y.
Vulcan-Cincinnati, Inc., 120 Sycamore St., Cincinnati 2, Ohio
Wigton-Abbott Corporation, 1225 South Avenue, Plainfield, N.J.
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